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AN ASSESSMENT OF CONDITION-BASED BUNDLING AS A PAYMENT OPTION FOR MEDICARE

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CONTENTS

Chapter **Page**

EXECUTIVE SUMMARY ix

I INTRODUCTION 1

A. BACKGROUND AND OBJECTIVES 1
B. OVERVIEW OF THIS REPORT 4

II CONCEPTUAL ISSUES 7

A. PRIOR RESEARCH 8

B. CRITERIA FOR SELECTING CONDITIONS 11

C. PARTICIPATION INCENTIVES 12

1. Incentives for Beneficiaries 12
2. Incentives for Providers 17

D. EXPECTED EFFECTS ON MEDICARE COSTS 19

1. Out-of-Network Service Use 20
2. Use of Emergency and Out-of-Area Services 23
3. Possible Gaming Behavior By Physician Groups 24
4. Defining Enrollment and Disenrollment 27
5. Setting Bundled Payment Rates 31

E. ADMINISTRATIVE BURDEN 35

III EMPIRICAL ANALYSIS 37

A. DATA SOURCES AND SAMPLE DESIGN 38

B. SELECTION OF CONDITIONS FOR THE ANALYSIS 40

C. DEVELOPMENT OF ANALYSIS FILES 41

D. ANALYSIS OF SELECTED ACUTE CONDITIONS 47

1. Descriptive Statistics 47
2. Additional Analysis of Hip Fracture Patients 55

E. ANALYSIS OF SELECTED CHRONIC CONDITIONS 74

CONTENTS *(continued)*

Chapter **Page**

IV CONCLUSIONS 85

REFERENCES 91

TABLES

Table **Page**

III.1 PROFILE OF MEDICARE BENEFICIARIES TREATED IN 1992 FOR SELECTED ACUTE CONDITIONS 48

III.2 MEDICARE PAYMENTS FOR BENEFICIARIES TREATED FOR SELECTED ACUTE CONDITIONS 49

III.3 MEAN MEDICARE PAYMENTS, BY DIAGNOSIS CATEGORY, FOR BENEFICIARIES TREATED FOR SELECTED ACUTE CONDITIONS 52

III.4 DISTRIBUTION OF PART B PAYMENTS ACROSS 30-DAY INTERVALS MEASURED FROM THE SERVICE DATE ON THE INDEX CLAIM FOR BENEFICIARIES TREATED FOR SELECTED ACUTE CONDITIONS 56

III.5 MEDICARE PAYMENTS FOR HIP FRACTURE, BY PATIENT CHARACTERISTICS 59

III.6 MEDICARE PAYMENTS FOR HIP FRACTURE, BY PATIENT CHARACTERISTICS (TRIMMED SAMPLE) 61

III.7 GAINS AND LOSSES FOR SETS OF 25 RANDOMLY DRAWN PATIENT GROUPS OF DIFFERING SIZE: HIP FRACTURE 65

III.8 GAINS AND LOSSES FOR SETS OF 25 RANDOMLY DRAWN PATIENT GROUPS OF DIFFERING SIZE: HIP FRACTURE 71

III.9 PROFILE OF MEDICARE BENEFICIARIES TREATED IN 1992 FOR SELECTED CHRONIC CONDITIONS 75

III.10 MEDICARE PAYMENTS FOR BENEFICIARIES WITH SELECTED CHRONIC CONDITIONS 78

III.11 DISTRIBUTION OF MEDICARE PAYMENTS FOR BENEFICIARIES WITH SELECTED CHRONIC CONDITIONS 80

III.12 PART B PAYMENTS FOR COMORBIDITIES AMONG MEDICARE BENEFICIARIES WITH SELECTED CHRONIC CONDITIONS 82

EXECUTIVE SUMMARY

OVERVIEW

Efforts to constrain the growth in Medicare expenditures have focused to a large extent on developing and implementing alternative payment approaches designed to give providers incentives to be more efficient in treating Medicare beneficiaries. The use of bundled payment rates is one possible method of altering the financial incentives facing physicians in the fee-for-service (FFS) sector to encourage greater efficiency. A variety of approaches to bundling have been proposed. In general, bundling involves defining the unit of payment not as the individual service, but rather as a more comprehensive set ("bundle") of services.

In this report, we assess whether HCFA should conduct a demonstration of a particular type of bundling, known as "condition-based bundling." Under this approach, Medicare would pay physician groups (and perhaps individual physicians) a fixed amount for providing a comprehensive bundle of services required to treat patients with a specified condition. For an acute condition such as hip fracture, physician groups would receive a fixed payment for managing the care of Medicare patients during the acute episode. For a chronic condition such as diabetes, physician groups would receive a fixed payment for managing the care of their patients for that condition over a specified time period. For example, a fixed rate might be developed for diabetes management over a three-month period.

Condition-based bundling would give physician groups incentives to be efficient in treating Medicare patients with the specified condition, since the groups would be at financial risk for such patients. If the groups are able to treat some patients at a cost below the bundled rate, they would keep the difference as profit. Conversely, if the cost of treating other patients exceeds the bundled rate, the groups would incur a loss on those patients. But the expectation would be that the losses on some patients would be offset by profits on other patients, so that physician groups with a moderately large number of Medicare patients with the given condition would receive bundled payments that, on average, would adequately compensate them for the care provided to such patients.

A demonstration of condition-based bundling could include various types of physician groups and, for some conditions, perhaps even individual physicians. We define the term "physician group" broadly in this study to include medical group practices, independent practice associations (IPAs), physician-hospital organizations (PHOs), and other types of integrated delivery systems (IDSs). IDSs encompass a range of organizational models in which physicians, at least one hospital, and in some cases other providers, act as a unified contracting agent with payers. Their organizational structure would facilitate bundling of Part A and Part B services for conditions that typically require inpatient care. We discussed the characteristics of PHOs and IDSs in Nelson and Frazer (1996).

In this report, we used two approaches to evaluate the feasibility and desirability of HCFA conducting a demonstration of condition-based bundling under Medicare. First, we conducted a conceptual analysis to examine in detail how such a demonstration would operate, what incentives would face providers and beneficiaries, what key obstacles would have to be overcome, what administrative burdens would be imposed on HCFA, and whether condition-based bundling is likely to be successful. Second, we conducted a statistical analysis of Medicare claims data to assess the suitability of selected medical conditions for a demonstration of condition-based bundling.

CONCEPTUAL ANALYSIS

We concluded that condition-based bundling for chronic conditions would face significant design obstacles that cast serious doubt on the likely success of this payment approach. Condition-based bundling for acute conditions that meet certain well-defined criteria would face less serious design obstacles and have greater potential for success. In a bundling demonstration for a chronic condition, physician groups would receive bundled payments from Medicare monthly or quarterly in exchange for agreeing to provide, or arrange for the provision of, all Medicare services required for the management of the chronic condition. The design obstacles that would face such a demonstration concern three issues: (1) out-of-network service use, (2) defining the "enrollment" period for payment purposes, and (3) potential gaming behavior by physicians.

The success of bundling for a chronic condition would depend on the extent to which enrollees (or patients) of the participating physician groups remain within those groups for all of their care covered under the bundled payment. If patients go outside their groups for care that should have been covered under the bundled rate, and if HCFA pays for that out-of-network service use without making corresponding adjustments to the bundled payments, bundling could lead to higher Medicare costs. A formal lock-in provision analogous to that used by HMOs, except limited to the condition covered under the bundled rate, is not likely to be feasible, since beneficiaries would be unlikely to accept such a restriction on their Medicare benefits--particularly when they could obtain care from a participating group without accepting that restriction.

Out-of-network service use could result from a variety of factors. For example, patients might decide to seek some care for the "bundled" condition from other physicians in their area, they may require care while traveling outside the area, or they may require emergency care and be transported to a hospital that is not affiliated with their physician group. Each of these circumstances would lead to the filing of FFS claims for services rendered for the bundled condition. In addition, if participating physician groups are not at risk for out-of-network service use, they would have incentives to refer their patients to other providers for expensive services (such as certain diagnostic procedures) rather than providing them under the bundled payment. For these reasons, HCFA would need to place participating physician groups at financial risk for out-of-network services. This would require that HCFA monitor the FFS claims of demonstration patients to determine their costs for out-of-network services.

A second major challenge confronting a bundling demonstration for a chronic condition is the difficulty that HCFA would face in determining on a continuing basis whether a particular beneficiary should still be consider enrolled in the group, and thus whether Medicare should continue making bundled payments for that person. For example, consider a beneficiary who makes an initial visit to a physician group to receive routine care for diabetes, enrolls in a diabetes management program offered by the group, but never returns for follow-up care. For how long should Medicare continue making monthly or quarterly bundled payments for such a person?

In principle, HCFA could make bundled payments only for beneficiaries who exceed a certain threshold number of visits per year. However, this would mean that physician groups would receive bundled payments only for their patients who are most expensive to treat and would receive FFS payments for the others. Physician groups would correctly argue that this bias should be taken into account when HCFA sets the bundled payment rate. In addition, making bundled payments only for beneficiaries who exceed a minimum number of visits would introduce incentives for physician groups to game the system by encouraging their healthiest patients to come for more visits than is medically necessary in order to continue receiving bundled payments for them (instead of the relatively low FFS payments they would otherwise receive for their healthiest patients).

HCFA could try to minimize this problem by selecting a chronic condition for which patients require active treatment on an ongoing basis, such as cancer. However, making bundled payments for the period in which patients are actively receiving cancer treatment would also be problematic, since physician groups would have an incentive to extend the period of "active" treatment beyond what might be considered medically necessary in order to continue receiving bundled payments for the patient over a longer period.

The third major challenge that would face a bundled payment system for a chronic condition is the potential for physicians to game the system. The key ways in which physicians could game such a system are through efforts to achieve favorable risk selection and "out-of-bundle" billing. The latter refers to the incentive that physicians who are treating patients for multiple conditions would face to submit FFS bills for services that are relevant to the treatment of both the bundled condition and another condition, rather than providing the service under the bundled payment. In addition, some physicians might falsely claim that a service they provided for the bundled condition was provided for another condition and thus submit a FFS bill to Medicare.

These design challenges would be significantly lessened under a bundled payment system for certain acute conditions. Because of the relatively short treatment period for acute conditions, there would be less opportunity for out-of-network service use. Furthermore, since the bundled payment would cover treatment throughout the acute episode of care, HCFA would not face the challenging task of determining the period of time over which it should continue making bundled payments for a given beneficiary. Although the possibility of gaming behavior by physician groups would remain under bundling for an acute condition, HCFA would have greater ability to limit such behavior than in the case of a chronic condition. For example, HCFA could require that all visits during the acute episode of care be covered under the bundled payment.

EMPIRICAL ANALYSIS

Our statistical analysis of Medicare claims data examined the suitability of six conditions for a bundling demonstration: three acute conditions (hip fracture, acute myocardial infarction, and septicemia) and three chronic conditions (diabetes, heart failure, and glaucoma). This analysis was based on 1992 Medicare claims for a 5 percent random sample of the national Medicare population that was not enrolled in a Medicare managed care plan. We concluded from this analysis that hip fracture deserves additional consideration for a bundling demonstration.

We conducted simulations of three bundled payment models for hip fracture, in which the services covered under the bundled rate are (1) Part B services only, (2) Part B services plus inpatient hospital care, and (3) Part B services, inpatient hospital care, and post-acute services. We included the final model as an option because 71 percent of the hip fracture patients in our sample used either SNF or home health services following hospital discharge. We conducted two sets of simulations, the first assuming a national bundled payment rate, and the second assuming a bundled rate that was adjusted to reflect regional differences in the mean costs to Medicare of treating hip fracture patients.

We conducted the simulations by randomly assigning hip fracture patients to sets of hypothetical physician groups of varying size. The simulations compared the bundled payments physician groups would receive under a demonstration with the actual payments that Medicare made for their patients. One of our objectives was to determine how many hip fracture patients were needed per group to permit adequate risk-spreading under each of the three bundling models--i.e., to limit the risk of some groups experiencing very large financial losses due to chance. Our second objective was to determine how groups would fare under the national rates versus the regionally-adjusted rates.

Our simulations indicated that under the regionally-adjusted rates, the hypothetical physician groups received bundled payments that were closer to the actual payments they received under the current payment system than was the case under the national rates. Whether such a result is desirable depends on the extent to which the current regional variation in the mean Medicare cost of treating hip fracture patients is appropriate. Based on the simulations using the regionally-adjusted rates, we found that adequate risk-spreading occurs with as few as 100 to 250 hip fracture patients per year. This was true for all three of the bundling models we examined, including the model in which post-acute services were covered under the bundled rate.

FUTURE RESEARCH

The results of our analysis on Medicare hip fracture patients suggest several areas for future research. First, it would be useful to conduct analyses of the type presented in this report on a much larger sample of hip fracture patients. Our sample of hip fracture patients was relatively small (4,522) because it was derived from a 5 percent sample of the national Medicare population. Consequently, we were required to construct hypothetical physician groups for our simulations by randomly assigning hip fracture patients within a given Census region to each group. A much larger sample could be obtained by using Medicare inpatient hospital claims to identify *all* Medicare beneficiaries who were treated for hip fracture in a given year. With this much larger sample, it would be possible to simulate the effects of a bundling demonstration for hip fracture on particular metropolitan and nonmetropolitan areas and, using the provider ID on the file, for specific hospitals. The latter would be particularly interesting, since it would be possible to assess whether and to what extent the case-mix of hip fracture patients varies across various types of hospitals (teaching versus nonteaching, inner-city versus suburban, and so on) and how these different types of hospitals would be affected by a bundled payment system.

It would also be useful to examine how a condition-based bundling demonstration for hip fracture patients would compare with a procedure-based demonstration in which bundled payments would be made for all Medicare patients who undergo certain hip procedures. The latter type of demonstration would include not only beneficiaries who require hip procedures because of a fracture but also those require such procedures because of other conditions, such as osteoarthrosis. This type of study could be conducted in the same manner as described in the previous paragraph, except that the sample would be selected on the basis of DRG codes rather than on the basis of principal diagnosis.

I. INTRODUCTION

A. BACKGROUND AND OBJECTIVES

Efforts to constrain the growth in Medicare expenditures have focused to a large extent on developing and implementing alternative payment approaches designed to give providers incentives to be more efficient in treating Medicare beneficiaries. This strategy has included efforts to expand the role of managed care plans in the Medicare program as well as efforts to reform and modify the Medicare fee-for-service (FFS) payment system. Through the Medicare Choices Demonstration and other initiatives, HCFA hopes to increase the proportion of the Medicare population enrolled in managed care plans that accept financial risk for their Medicare enrollees. Recognizing that the majority of beneficiaries are likely to remain in the FFS sector--at least in the near term and perhaps over the longer term as well--HCFA also continues to search for ways to modify the economic incentives facing FFS providers to encourage greater efficiency.

In 1992, the Medicare program began phasing in a fee schedule based on a resource-based relative value scale to replace the charge-based system that had previously been used to determine physician payments under Medicare. Although the fee schedule has resulted in a more equitable fee structure, it retains some of the basic limitations of FFS payment systems. Namely, it rewards physicians for providing additional services and gives them no incentive to consider the costs of referral services. The Volume Performance Standard (VPS) system that was implemented with the Medicare fee schedule was designed to give physicians incentives to restrain the growth in Medicare outlays for physician services, but since fee updates under the VPS system are based on how actual expenditures compare with expenditure targets *nationally*, it provides little or no incentive for individual physicians to modify their behavior. In addition, since the VPS system covers Part B expenditures only, it does not give physicians any incentives to be cost conscious in ordering Part A services for their Medicare patients.

The use of bundled payment rates is one possible method of altering the financial incentives facing physicians in the FFS sector to encourage greater efficiency. A variety of approaches to bundling have been proposed. In general, bundling involves defining the unit of payment not as the individual service, but rather as a more comprehensive set ("bundle") of services. In this report, we assess whether HCFA should conduct a demonstration of a particular type of bundling, known as "condition-based bundling." Under this approach, Medicare would pay physician groups (and perhaps individual physicians) a fixed amount for providing a comprehensive bundle of services required to treat patients with a specified condition. For an acute condition such as hip fracture, physician groups would receive a fixed payment for managing the care of Medicare patients during the acute episode. For a chronic condition such as diabetes, physician groups would receive a fixed payment for managing the care of their patients *for that condition* over a specified time period. For example, a fixed rate might be developed for diabetes management over a three-month period.

Condition-based bundling would give physician groups incentives to be efficient in treating Medicare patients with the specified condition, since the groups would be at financial risk for such patients. If the groups are able to treat some patients at a cost below the bundled rate, they would keep the difference as profit. Conversely, if the cost of treating other patients exceeds the bundled rate, the groups would incur a loss on those patients. But the expectation would be that the losses on some patients would be offset by profits on other patients, so that physician groups with a moderately large number of Medicare patients with the given condition would receive bundled payments that, on average, would adequately compensate them for the care provided to such patients.

The effectiveness of a condition-based bundling arrangement would depend in part on the scope of services covered under the fixed payment. The payment could be designed to cover all Part B services associated with treating the specified condition, or it could be expanded to also include inpatient hospital care and perhaps other Part A services. The appropriate design depends on the condition for which the bundled rate is being developed. For example, if the condition is one in which inpatient hospital care is required for some or all patients, including inpatient care under the bundled rate would provide incentives for physician groups to use the most efficient mix of inpatient and outpatient care. It would also eliminate the incentive physician groups would otherwise have to hospitalize marginal cases, which would allow them to treat such patients using the hospital's resources rather than resources covered under the bundled payment. If a significant percentage of Medicare patients with the given condition also require post-acute care, a bundled payment that includes Part B, inpatient, and post-acute services would give physician groups incentives to provide the most efficient mix of services across this entire continuum of care.

A demonstration of condition-based bundling could include various types of physician groups and, for some conditions, perhaps even individual physicians. We define the term "physician group" broadly in this study to include medical group practices, independent practice associations (IPAs), physician-hospital organizations (PHOs), and other types of integrated delivery systems (IDSs). IDSs encompass a range of organizational models in which physicians, at least one hospital, and in some cases other providers, act as a unified contracting agent with payers. Their organizational structure would facilitate bundling of Part A and Part B services for conditions that typically require inpatient care. We discussed the characteristics of PHOs and IDSs in Nelson and Frazer (1996).

Condition-based bundling is the only type of bundling examined in this study. A number of other approaches to bundling physician services have been studied in previous HCFA-funded projects in which some concept other than the patient's diagnosis was used to define the bundle. Examples include bundling based on surgical or diagnostic procedures, physician office visits, and hospitalizations (Mitchell et al. 1987; Lee et al. 1992). The most widely used approach to bundling physician services is to define the bundle based on a procedure. For example, the Medicare program and most private insurers have adopted a global fee policy for major surgery, in which surgeons receive a global fee that covers the surgery itself plus follow-up care during a 90-day post-operative period. In other examples of procedure-based bundling, the professional and institutional components are bundled into a single payment. Many managed care plans obtain such bundled rates for highly specialized procedures such as cardiac surgery, neurosurgery, orthopedic surgery, and organ transplants (Jaklevic 1995; Kongstvedt 1995). HCFA has experimented with this type of bundling through the Medicare bundling demonstrations for heart bypass and cataract surgery.

This report was produced under the Medicare Physician Capitation project. In a separate report for this project, we assessed the advisability of HCFA conducting demonstrations of various other approaches to placing physician groups at financial risk under Medicare, including (1) capitation for some or all Medicare services, possibly with a risk-sharing arrangement between HCFA and the groups for noncapitated services; (2) blended capitation and FFS payment for some or all Medicare services; and (3) incorporation of a risk-sharing arrangement between the groups and HCFA into the existing FFS system (Nelson and Frazer 1996). That report concluded that the feasibility and likely success of a demonstration of such contracting arrangements is greatest for large IDSs that are capable of providing the full range of Medicare services and that have a history of successful risk-based contracting with private payers. Such a demonstration would face significantly greater design and regulatory obstacles if the participants were medical groups or IPAs that are not organized as IDSs.

B. OVERVIEW OF THIS REPORT

This report consists of four chapters. In Chapter II, we provide a conceptual analysis of the feasibility and desirability of condition-based bundling under Medicare, and we identify important challenges or obstacles that would have to be overcome if HCFA were to implement a demonstration of this payment option. Our conceptual analysis examines criteria for selecting conditions for a bundling demonstration, possible participation incentives for beneficiaries and providers, expected effects on Medicare costs and quality of care, and administrative complexity and costs.

In Chapter III, we use claims data on a national sample of the Medicare population to empirically sess the suitability of specific medical conditions for a bundling demonstration. We also conduct simulations to examine the number of Medicare patients that would be required per physician group to permit adequate risk-spreading under a bundling demonstration. We present our conclusions in Chapter IV.

II. CONCEPTUAL ISSUES

In this chapter, we examine a variety of conceptual issues to assist HCFA in determining whether condition-based bundling is a sufficiently promising approach to justify a demonstration and, if so, how such a demonstration should be designed. Condition-based bundling can be considered for both acute and chronic conditions. Our conceptual analysis in this chapter indicates that a bundling demonstration for a chronic condition would face significant design obstacles that cast serious doubt on whether such an initiative is likely to be successful. A bundling demonstration for certain types of acute conditions would face less serious design obstacles and have greater potential for success.

Under bundling for an acute condition, participating physician groups would receive a bundled payment from Medicare for treating beneficiaries with the particular condition and managing their care during the acute episode. A bundling demonstration for an acute condition would not require that beneficiaries face an enrollment decision. Instead, beneficiaries with the specified condition would "participate" in the demonstration by choosing to receive care for the condition from a participating physician group. Nonparticipating physician groups would continue to be paid under the regular Medicare program.[1]

In a bundling demonstration for a chronic condition, participating physician groups would agree to manage the care of beneficiaries with the condition in return for receiving bundled payments from Medicare periodically (e.g., monthly or quarterly). Such a demonstration would most likely require an enrollment-model design--i.e., beneficiaries in the demonstration sites would face an explicit choice of whether or not to enroll in a participating physician group, where "enrollment" in this context would be an agreement by beneficiaries to have their care for the specified condition managed by the group. We also consider the feasibility of a nonenrollment-model design for certain types of chronic conditions, which would not require that beneficiaries face a formal enrollment decision. This approach would be feasible only if there are strong reasons to expect that, once beneficiaries with the particular condition begin a course of treatment with a participating physician group, they will voluntarily remain with the group for all of their care for that condition.

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[1] Throughout this chapter, we use the terms participating and nonparticipating physician groups to distinguish groups that participate in a bundling demonstration from those that do not. Our use of these terms does not pertain to Medicare's Participating Physician and Supplier Program.

To provide background for our discussion and analysis of condition-based bundling, we begin with a review of prior research on this type of bundling. We then assess the feasibility and desirability of a demonstration of condition-based bundling under Medicare, organizing our discussion around the following topics:

- Criteria for selecting conditions
- Participation incentives for beneficiaries and providers
- Expected effects on Medicare costs
- Administrative burden

Our discussion of expected effects on Medicare costs addresses a variety of specific issues such as the potential for gaming behavior by physician groups, the implications of beneficiaries going outside their designated physician group for services covered under the bundled payment, and approaches to setting bundled payment rates.

A. PRIOR RESEARCH

Prior studies have examined a variety of approaches to bundling physician services under Medicare. We limit our review to studies of condition-based bundling, since these are the studies most directly relevant to the current study. Mitchell et al. (1987) evaluated the feasibility of bundling ambulatory physician services for Medicare beneficiaries with hypertension and diabetes. Using 1981 Part B claims for Michigan and South Carolina, Mitchell et al. found that ambulatory physician charges for hypertension patients over a three-month period had a mean of $134 and exhibited significant variation about the mean. The coefficient of variation, which is the ratio of the standard deviation to the mean, was 1.36. Ambulatory charges for patients with diabetes had a similar mean ($140) and also exhibited significant variation about the mean. For each condition, these figures include charges for *all* ambulatory physician services received by beneficiaries with the index diagnosis (i.e., hypertension or diabetes) rather than services provided specifically for that diagnosis. Almost two-thirds of the services captured in the ambulatory bundles for hypertension and diabetes were for diagnoses other than the one used to define the bundle. Thus, bundles were defined more broadly in that analysis than we have defined them for this report.

Mitchell et al. noted that the significant number of services provided to hypertension and diabetes patients for other conditions would pose a serious challenge to this type of bundling. For example, if physicians are allowed to bill on a FFS basis for such "out-of-condition"services, this would introduce the risk that physicians could game the system by submitting FFS bills for services that should have been covered under the bundled rate. Mitchell et al. also noted that the prevalence of multiple chronic conditions among the Medicare population would seriously complicate any effort to implement condition-based bundling for chronic diseases. To operate such a payment system, it would be necessary for HCFA to classify and reclassify, as necessary, millions of Medicare beneficiaries by chronic disease and periodically verify those classifications. Based on these considerations and the significant variation in ambulatory physician charges for hypertension and diabetes patients, Mitchell et al. concluded that, "ambulatory condition packages [i.e., bundles] are probably infeasible as a means of paying physicians for services rendered to Medicare beneficiaries" (p. 331).

Lee et al. (1992) evaluated a variety of approaches to bundling outpatient physician services, including condition-based bundling, using Part B claims for 1988 for five states (Arizona, Connecticut, Georgia, Kansas, and Washington). Their analysis of condition-based bundling focused on cancer. Their analysis was severely limited by the absence of diagnosis codes on their Part B claims data, however. Instead of using diagnosis codes to identify cancer patients, they used procedure codes to identify patients who received cancer-related services during the analysis year. For each beneficiary so identified, Lee et al. defined the "gatekeeping" provider as the first provider of outpatient chemotherapy during the analysis year, and they assumed that all services the beneficiary subsequently received from that provider were related to cancer. They also identified all outpatient chemotherapy and radiotherapy services that sample members received from other providers.

Lee et al. restricted their analysis to beneficiaries who were hospitalized for cancer in 1987 or 1988 and used the diagnosis codes on the inpatient claims to classify sample members by type of cancer. In their analysis, however, they defined the bundle of cancer-related services to include outpatient services only. From the charges on Part B claims for cancer-related services, Lee et al. derived a monthly bundled rate (similar to a capitation payment) for outpatient cancer treatment. Under their payment model, Medicare would make this payment for each month in which a patient is receiving active cancer treatment, which is defined as any month in which the patient receives chemotherapy or radiotherapy or visits the gatekeeping provider. Lee et al. concluded that the bundling model for cancer treatment as specified in their study is not promising, since their data analysis indicated that providers would be exposed to unacceptably high levels of financial risk. They argued that cancer treatment is a promising area for bundled payment, however, and recommended further research using claims data that include diagnosis codes.

An important limitation of the Lee et al. analysis is their decision to focus strictly on outpatient services in defining the bundled rate. The authors acknowledged this limitation, but we believe it deserves greater attention than it was given in their report. The authors noted that about 40 percent of the chemotherapy patients in their sample were admitted to a hospital with a cancer diagnosis in the analysis year. This strongly suggests that if HCFA were to develop a bundled rate for treatment of certain types of cancer, it would be desirable to include both inpatient and outpatient services under the bundled rate, since this would give providers an incentive to use the most cost-effective setting for providing care.

Otherwise, if the bundled rate covers outpatient care only (as in the Lee et al. analysis), physicians would have an incentive to hospitalize patients to shift them into the FFS environment and use the resources provided by the hospital rather than resources covered under the bundled rate.

Lee et al. also concluded that podiatry services offer a promising opportunity for bundling. Using 1988 Part B claims for the five states mentioned previously, they developed separate bundled rates for three subgroups of beneficiaries that they defined as the foot cohort, the nail cohort, and the nonprocedure cohort.[2] They developed the bundled rate for each cohort based on charges for podiatry services over a 6-month period that began for each sample member on the date of the "index" podiatry claim (i.e., the first claim for podiatry services in the analysis year). Lee et al. noted that it would be preferable to develop bundled rates for subgroups based on diagnosis rather than on their foot/nail/nonprocedure classification, and recommended additional research using claims that contain diagnosis codes.

B. CRITERIA FOR SELECTING CONDITIONS

The selection of conditions for a bundling demonstration should be guided by several basic criteria. First, to offer the potential for significant cost containment, the total Medicare expenditures attributable the condition should be relatively high. Second, Medicare beneficiaries with the condition should be relatively homogeneous from a clinical perspective. Thus, they should have similar needs for care, and the resource costs of medically appropriate care for their condition should exhibit small to moderate variation about the mean. This is important for the averaging concept on which bundling is based, in which small to moderate losses on some patients would be offset by small to moderate gains on other patients so that, on average, a given physician group would be adequately compensated for the costs of medically appropriate care. If Medicare patients with the condition are not relatively homogeneous clinically, physician groups would be unlikely to participate in a bundling demonstration, since it could expose them to unacceptable levels of financial risk.

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[2] The foot cohort included patients who received at least one foot procedure, the nail cohort included patients who had at least one nail procedure but no foot procedure, and the nonprocedure cohort included patients who had at least two claims from a podiatrist but no foot or nail procedures. The nail cohort constituted 63 percent of their podiatry patient sample, the nonprocedure cohort 33 percent, and the foot cohort 4 percent.

A third criterion is that the condition should be sufficiently prevalent in the Medicare population so that physician groups, at least in larger metropolitan areas, would have enough cases per year to permit adequate risk-spreading.[3] The number of cases required for adequate risk-spreading depends on the variability of treatment costs across cases and would thus need to be assessed on a condition-by-condition basis. Other criteria are introduced in the sections that follow, which discuss participation incentives for physician groups and beneficiaries, cost-containment potential, and administrative burden.

C. PARTICIPATION INCENTIVES

To achieve its objectives, a bundling demonstration would need to include incentives that would, over time, lead to a significant level of participation by beneficiaries and physician groups.

1. Incentives for Beneficiaries

Bundling for a Chronic Condition. A bundling demonstration for a chronic condition could potentially be based on either an enrollment-model or a nonenrollment-model design. We begin by discussing an enrollment-model design and then discuss how a nonenrollment-model design would differ. Under each design, participating physician groups would receive bundled payments from Medicare periodically (e.g., monthly or quarterly) for managing the care of their Medicare enrollees (or patients) for the particular chronic condition.

For an enrollment-model demonstration, incentives would need to be developed to encourage beneficiaries with the specified condition to enroll in a participating physician group and then, once enrolled, to remain within the group for their care for that condition. For most beneficiaries, the strongest incentive to enroll would be an expectation that the group would provide higher quality and better coordinated care for their condition than would be available elsewhere in the community. Thus, limiting participation in the demonstration to physician groups that satisfy strict criteria related to quality of care, and perhaps designating them as centers of excellence or otherwise publicizing their high-quality standards, would likely provide an effective enrollment incentive. Another possible enrollment incentive would be coverage for additional services not covered under the Medicare program. For example, in a bundling demonstration for diabetes, physician groups might use the bundled payments to offer enrollees such services as diabetes education programs, nutrition counseling, and therapeutic footwear. The groups would have an incentive to offer such benefits if they believe the costs would be outweighed by savings achieved through a lower incidence of high-cost complications among their diabetic patients.

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[3] By adequate risk-spreading, we mean that there would be enough cases so that the losses a physician group experiences on some patients would be offset by the profits on other patients so that, on average, the bundled payment rate would provide adequate compensation for the cost of medically appropriate care.

A key design issue for an enrollment-model demonstration is the specification of enrollee cost-sharing requirements. The demonstration design could allow each participating physician group to specify its own cost-sharing requirements, just as Medicare risk HMOs are allowed to do, or it could specify uniform cost-sharing requirements for all groups. In either case, enrollee cost-sharing would most likely take the form of per-visit copayments. For some conditions, fixed-dollar copayments for certain diagnostic and therapeutic procedures could also be considered. To attract enrollees and encourage them to use certain types of services, some groups might prefer not to charge copayments for certain types of visits (e.g., visits for recommended tests).

Even if the cost-sharing requirements under the demonstration are significantly less than the cost-sharing requirements under the regular Medicare program, this is not likely to be an effective enrollment incentive for the vast majority of beneficiaries. Recent analyses we have conducted on the Medicare Current Beneficiary Survey indicate that nearly 90 percent of all Medicare beneficiaries have either private supplemental insurance or Medicaid and are thus largely protected from Medicare cost-sharing. And since the reduced cost-sharing requirements under the demonstration would only apply to services received for the condition covered under the demonstration, beneficiaries who enroll in such a demonstration would be expected to keep their supplemental coverage. A reduction in cost-sharing requirements would therefore be a potentially effective enrollment incentive only for the 10 percent of the Medicare population that does not have supplemental insurance or Medicaid.

For an enrollment-model demonstration to be successful, beneficiaries who enroll in a physician group for a given condition should remain within the group for all of their Medicare services related to that condition. If enrollees go outside their designated physician group to receive care for the specified condition, and if Medicare pays for that care, the demonstration could lead to increased Medicare costs--unless offsetting adjustments are made to the bundled payments in a manner described below in section D. Otherwise, Medicare would pay twice for the care of some demonstration enrollees--once with the bundled payments and again with FFS payments to other providers for services that should have been covered under the bundled rate. We refer to the latter as "out-of-network" services.

Out-of-network service use could result either from the choice behavior of enrollees, which is our focus in this section, or from the behavior of participating physician groups, which we discuss below in section D.[4] One way to ensure that Medicare does not pay for out-of-network services would be through a formal "lock-in" provision, in which demonstration enrollees would not have Medicare benefits for services received outside their designated physician group for the specified condition, except in the case of emergencies and urgent out-of-area care. Unlike the lock-in provision with a Medicare risk HMO, enrollees would retain full Medicare benefits for services received outside the group that are not related to the specified condition. We do not believe a bundling demonstration that includes a lock-in provision would be successful at attracting enrollees, however, since it is unlikely that beneficiaries would voluntarily accept such a restriction on their Medicare benefits--particularly since they could presumably continue to receive care from participating physician groups without accepting that restriction.

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[4] For example, some participating physician groups might try to game the system by referring their enrollees to other providers for some expensive services rather than providing them under the bundled payment.

In the absence of a lock-in provision, HCFA would need to rely on other approaches to encourage beneficiaries to remain within their designated physician group for their care for the specified condition. One approach is to select a condition for the demonstration for which highly specialized treatment is required. This would reduce the likelihood that enrollees would obtain care for the condition from physicians outside their designated physician group. For example, beneficiaries obtaining care for glaucoma from an ophthalmology group would not be likely to obtain care for that condition from their primary care physician or any other specialists they see. Instead, if they are unhappy with the care they are receiving, they could switch to another ophthalmologist within the group or switch to another group (i.e., "disenroll" from their group). Treatment for cancer would be similar in this respect.

HCFA could also attempt to persuade demonstration enrollees to stay within their designated physician group for all of their care for the specified condition by distributing materials to beneficiaries at the time of enrollment emphasizing the importance of having their care coordinated by their physician within the group. In addition, beneficiaries would be more likely to remain within the group for their care if the expectation of receiving high quality care was the main reason they enrolled.

A nonenrollment-model bundling demonstration for a chronic condition would differ from the model just described in that beneficiaries would not formally enroll with a physician group. Instead, beneficiaries with the particular condition would seek care from a provider in the community in the same manner as they would in the absence of the demonstration. If the participating physician groups are recognized as centers of excellence or otherwise increase their stature in the community as a result of the demonstration, beneficiaries might be more likely to obtain care from those groups (either through self-referral or referral by their primary care physician). Although beneficiaries who obtain care from a participating physician group would not be asked to enroll in the group, they would be regarded for payment purposes as being "enrolled" in a treatment program offered by the group. Thus, physician groups would receive bundled payments from Medicare periodically for each patient as long as they continue to manage the care of the patient for the specified condition. HCFA could rely on the same approaches described above for an enrollment-model demonstration to encourage beneficiaries to receive all of their care for the specified condition from their chosen physician group.

As we have defined them, an enrollment-model design without a lock-in is similar in many respects to a nonenrollment-model design. The key difference is that the enrollment-model design would include a formal enrollment process in which beneficiaries would complete a form (perhaps with HCFA letterhead) indicating their intention to obtain their care for the specified condition from the participating physician group and inform the group immediately if they decide to switch providers or move from the area. The enrollment form would stress the benefits of having a particular provider within the group coordinate all of the beneficiary's care for the condition covered under the demonstration. The absence of a lock-in would be made explicit, however, by making clear that beneficiaries retain the right to obtain care elsewhere. The purpose of the enrollment process would be to encourage beneficiaries to remain within the physician group for all of their care for the specified condition.

Bundling for an Acute Condition. In a bundling demonstration for an acute condition, Medicare beneficiaries would participate in the demonstration when they obtain care for the condition from a participating physician group, and the group manages their care throughout the acute episode. As in the case of a chronic condition, the strongest incentive for beneficiaries to obtain care from a participating physician group would be the expectation of receiving high quality care. For an acute condition that requires emergency treatment, however, the decision on where to obtain care is likely to be made under duress and influenced by factors such as the hospital(s) at which the beneficiary's primary care physician has admitting privileges, the overall reputation of the hospital for emergency care, and the travel time to the hospital from the beneficiary's location. In a bundling demonstration for an acute condition that requires emergency treatment, when beneficiaries receive treatment at a hospital affiliated with a participating physician group--e.g., at the hospital component of a participating physician-hospital organization (PHO) or other type of integrated delivery system (IDS)--then the PHO or IDS would receive a bundled payment from Medicare.

The acute condition chosen for a bundling demonstration should be one for which the natural course of the illness or injury and its treatment occur over a relatively short time period for most beneficiaries, and a single provider typically coordinates the patient's care throughout the acute episode. These criteria would reduce the opportunity for patients to obtain care for the condition outside the participating physician group. Thus, out-of-network service use due to the choice behavior of beneficiaries would likely be a less serious concern for an acute condition than for a chronic condition.

2. Incentives for Providers

When providers offer bundled pricing arrangements to private payers, their goal is usually to increase patient volume. For example, it is common for providers of highly specialized services such as cardiac surgery and neurosurgery to negotiate bundled payment rates with HMOs that represent a substantial discount off their usual charges. In return, the providers expect that the HMOs will steer additional patients to them for the procedure or condition covered under the agreement (Kongstvedt 1995; Jaklevic 1995).[5] With an HMO, this steerage of patients can be accomplished by including only a limited number of providers in the network that offer the specialized service covered under the bundled pricing arrangement.

The potential for increased patient volume would also be an important incentive for physician groups to participate in a demonstration of condition-based bundling under Medicare. The Medicare program would have much less ability than HMOs to steer patients to participating physician groups, however. The best way to achieve this objective would be for HCFA to design the demonstration not only to test condition-based bundling but also to designate some providers as centers of excellence for treating certain conditions. Thus, to participate in the demonstration, physician groups would be required to meet strict criteria for providing high-quality care for the specified condition and would agree to accept bundled payments for that condition. Participation in such a demonstration could enhance the reputation of participating physician groups and increase their visibility in the community, which could increase both their Medicare and commercial business.

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[5] Providers may also offer bundled services at a discounted rate as a defensive measure--i.e., as a way to avoid being excluded from an HMO's network and thus losing patients.

A second possible incentive for physician groups to participate in a bundling demonstration is that the bundled payments would give the groups greater flexibility in treating their patients, since the demonstration would presumably allow them to use the payments to provide services not currently covered under the Medicare program (e.g., the services mentioned above relevant to the management of diabetes). For some conditions, this might enable physician groups to improve the quality of care and health outcomes of their Medicare patients. In addition, bundling has the potential to simplify the billing procedures of physician groups, since they would submit a single bill for the bundle of services rather than separate bills for each visit.

The key disadvantage of participating in bundling demonstration from the perspective of physician groups is that it would require them to accept financial risk for their Medicare patients. Depending on the design of the payment mechanism, the groups may have concerns about experiencing financial losses due to adverse selection that is not accounted for in the payment mechanism and losses due to the presence of high-cost outliers among their Medicare patients. In addition, a bundling demonstration would eliminate the groups' ability to generate additional payments by increasing the volume of services provided per patient.

D. EXPECTED EFFECTS ON MEDICARE COSTS

Condition-based bundling could introduce incentives for physician groups to become more efficient in providing care to beneficiaries with the specified condition and allow the Medicare program to achieve cost savings on such beneficiaries. Physician groups would have incentives to achieve cost efficiencies under bundling since they could profit financially if, on average, their costs of providing the services covered under the bundling arrangement are less than the bundled payments they receive from Medicare. Thus, physician groups would have incentives to coordinate patient care to reduce the use of duplicate services, eliminate the use of unnecessary services, use the most efficient mix of services, and reduce the incidence of complications through proper care management. The Medicare program could achieve cost savings under bundling if the bundled payment rate is set below the amount that Medicare would pay on average under the FFS system for services provided to beneficiaries with the specified condition.

On the other hand, condition-based bundling could lead to a number of undesirable outcomes. For example, the Medicare program might not achieve the expected cost savings if physician groups game the system or if the groups experience favorable selection that is not fully accounted for in the bundled payment mechanism. Physician groups could potentially game the system in various ways, such as "billing outside the bundle" for services that should have been covered under the bundled payment. In addition, the financial risk created by bundling could cause some physician groups to skimp on care.

To provide incentives for cost-effective care, the bundled payment should include, at a minimum, all Part B services required for treating the condition covered under the bundling arrangement. This would give participating physician groups incentives to be cost conscious not only in the services they provide directly but also in referral services, such as referrals for diagnostic laboratory and radiology services. If the condition requires hospitalization for a significant proportion of patients, serious consideration should be given to either including inpatient hospital care under the bundled payment or, alternatively, including inpatient care in a risk-sharing arrangement between HCFA and the participating physician groups.

Otherwise, the groups would have an incentive to hospitalize marginal cases, since this would allow them to use the resources of the hospital to treat such patients rather than treating them using resources covered under the bundled payment.

Additional decisions regarding the scope of services to be covered under the bundled payment will depend in part on the condition being considered for a demonstration. For example, in a bundling demonstration for hip fracture, there may be advantages to defining the bundled payment to include post-acute care as well as inpatient care and Part B services. In our analysis of Medicare patients hospitalized for hip fracture during the first half of 1992 (which we discuss in Chapter III), we found that 71 percent used skilled nursing facility (SNF) care or home health care following the hospitalization. Covering the costs of such care under the bundled payment would give physician groups financial incentives to provide the most efficient mix of services across the entire spectrum of care needed by Medicare hip fracture patients.

Our discussion of the potential effects of condition-bundling on Medicare costs is organized around the following issues:

- The implications of "out-of-network" service use by beneficiaries
- The implications of out-of-area and emergency service use by beneficiaries
- Possible gaming behavior by physician groups
- Defining "enrollment" and "disenrollment" under bundling for a chronic condition
- Setting bundled payment rates

1. Out-of-Network Service Use

The payment mechanism for a condition-based bundling demonstration must account for the possibility that some beneficiaries being treated under the demonstration might obtain care for the specified condition from providers other than their participating physician group. If HCFA reimburses those providers under FFS without making a corresponding downward adjustment in the bundled payments, the demonstration would likely lead to higher Medicare costs. We noted above that a lock-in model is not likely to be feasible for a bundling demonstration, so we focus on the three design options that do not involve a lock-in: (1) bundling for a chronic condition with an enrollment-model design but no lock-in, (2) bundling for a chronic condition with a nonenrollment-model design, and (3) bundling for an acute condition (which by definition involves a nonenrollment-model design).

In a bundling demonstration for a chronic condition, participating physician groups should be at financial risk for out-of-network services received by patients they are treating under the demonstration. Otherwise, the groups would have an incentive to refer patients to other providers for some services, which would be provided under the FFS system, while continuing to receive the full bundled payment rate. For example, rather than providing expensive diagnostic laboratory and radiology services under the bundled payment rate (i.e., either within the group itself or within laboratory and radiology facilities the group officially contracted with for the demonstration), the groups might refer some patients to other facilities that would submit bills under the FFS system. Some out-of-network service use would still be expected due to the decisions by beneficiaries to obtain care elsewhere, but if physician groups are at risk for such services, they would have an incentive to encourage their patients to obtain all their care for the specified condition within the group.

Placing physician groups at financial risk for out-of-network services may not be necessary in a bundling demonstration for some acute conditions, although this should be evaluated on a condition-by-condition basis. For acute conditions that require emergency hospitalization, there may be little opportunity for out-of-network service use, so HCFA may decide not to place physician groups at financial risk for such services. The extent of out-of-network service use should be carefully monitored in such a demonstration, however, to determine whether the payment mechanism should be changed to place physician groups at risk for such services.

One way of placing physician groups at risk for out-of-network service use is for HCFA to withhold a fixed percentage of the bundled payment rate and keep those withheld funds in a pool to cover the costs of out-of-network services. HCFA would then periodically (e.g., annually or semi-annually) return any excess funds in each group's withholding account to the group. If the costs of out-of-network services for a particular group exceed the funds in its withholding account, the group would not receive any of the withheld funds. Furthermore, if the shortfall in the withholding account is relatively large, HCFA could increase the withholding percentage to reflect its updated projection of the magnitude of out-of-network costs.

Alternatively, HCFA could account for the projected costs of out-of-network services when setting the bundled payment rate in the first year of the demonstration, and then adjust the rate upward or downward in future years as it modifies its projections based on actual claims experience. Thus, for the first year of the demonstration, HCFA would set the bundled rate at a level such that, after allowing for the projected level of out-of-network costs, HCFA would still expect to experience cost savings on beneficiaries treated under the demonstration. The participating physician groups would have an incentive to try to limit their Medicare patients' use of out-of-network services, since if the costs of those services exceed HCFA's projection, HCFA would reduce the bundled payment rate by a corresponding percentage for the second year of the demonstration.

We expect that, for many conditions, physician groups would be reluctant to accept financial risk for their patients' out-of-network service use. Physician groups would not be able to prevent their patients from using other providers, so the groups would face significant uncertainty in trying to predict the costs of out-of-network services. If a bundling demonstration for an acute condition could be implemented without placing physician groups at risk for out-of-network services, this would be a significant advantage of acute conditions over chronic conditions in obtaining provider participation for such a demonstration.

To place physician groups at risk for out-of-network services, HCFA would need to monitor the FFS claims of beneficiaries whose care is being provided under the demonstration to determine whether any of the services on those claims should have been provided under the bundled payments. For many services, making this distinction based on the diagnosis codes on claims should be straightforward in principle, although the ability to make such distinctions correctly depends on the completeness and reliability of those codes. In an analysis of Part B claims from the National Claims History File for the first quarter of 1992, Lee et al. (1993) found that line-item diagnosis codes were present on nearly 100 percent of the claims for most types of physician services. Diagnosis codes were missing for over 10 percent of the claims for some types of laboratory tests, however. Furthermore, between 17 and 30 percent of the line-item diagnoses reported for certain laboratory tests were coded as "special investigations and examinations--laboratory examination," and between 20 and 40 percent of the line-item diagnoses reported for standard and advanced imaging tests were coded as "special investigations and examinations--radiologic examination." Unless these limitations of Part B diagnostic codes are resolved, HCFA may have difficulty determining whether some ancillary services received by beneficiaries outside their physician group should have been covered under the bundled payment.

2. Use of Emergency and Out-of-Area Services

Emergency services and services obtained from out-of-area providers are two categories of out-of-network services that should not be overlooked in the design of a condition-based bundling demonstration. For example, among beneficiaries being treated for a chronic condition that is not so debilitating as to prevent out-of-area travel, some beneficiaries would be expected to occasionally require treatment for the condition from an out-of-area provider, and some may require out-of-area hospitalization. Furthermore, some beneficiaries being treated for a chronic or acute condition may require emergency treatment for the condition and be taken to an emergency facility near their home that is not affiliated with their demonstration physician group. HCFA would need to deal with the costs of such services using either of the approaches described above for dealing with out-of-network services in general.

The costs of out-of-network emergency care and out-of-area care are important issues for the HMO industry. Medicare risk HMOs refuse to pay for out-of-area care unless they regard the care as urgent and refuse to pay for within-area emergency services received outside the plan unless they regard the case as a genuine emergency. When HMOs refuse to pay for such services, the beneficiary is responsible for the bill. Thus, beneficiaries who understand this policy have a strong incentive to limit their use of such services to cases in which they believe the HMO will cover the bill. In a condition-based bundling demonstration without a lock-in, beneficiaries would not face similar incentives to be judicious in their use of out-of-area care or out-of-network emergency care. Thus, accounting for such costs when developing the payment mechanism could be critical to the success of the demonstration in controlling Medicare costs.

3. Possible Gaming Behavior By Physician Groups

Physician groups participating in a demonstration of condition-based bundling could engage in various types of gaming behavior--i.e., efforts to increase their net revenues from Medicare by circumventing the basic rules and intent of the demonstration. Previously, we noted that some groups might refer their patients to other providers for certain expensive procedures rather than provide them under the bundled payment. We therefore recommended that groups be placed at financial risk for out-of-network services, particularly in the case of a bundling demonstration for a chronic condition. In this section, we discuss three other types of gaming behavior: (1) efforts to achieve favorable risk selection, (2) out-of-bundle billing, and (3) upcoding patients into higher cost bundles.

Efforts to Achieve Favorable Risk Selection. The net revenues earned by a physician group under condition-based bundling would be the difference between the bundled payments they receive from Medicare and the resource costs of treating the Medicare patients covered under the bundling arrangement. Thus, one approach by which physician groups could attempt to increase their net revenues under a bundling demonstration would be to try to attract the lowest risk cases (i.e., the cases least expensive to treat) among beneficiaries in their area with the specified conditi Although HCFA should require that participating physician groups accept all Medicare beneficiaries with the condition covered under the demonstration, there are various ways in which some groups might circumvent this rule.[6]

For example, in an enrollment-model demonstration for a chronic condition, physicians might emphasize the benefits of the demonstration only in discussions with their lowest risk patients--i.e., those with the least severe cases and/or those whom the physicians believe are most likely to comply with their instructions concerning follow-up visits and relevant health-related behaviors. In their discussions with higher risk patients, physicians might fail to mention the demonstration or emphasize its disadvantages, in an effort to continue treating them under FFS arrangements rather than under the bundled rate.

In a bundling demonstration for a chronic condition based on a nonenrollment model, physician groups would receive bundled payments for all of their Medicare patients with the specified condition and would thus have less ability to achieve favorable risk selection under the demonstration. However, some physician groups might try to influence the risk selection of their new patients by accepting only the lowest risk cases and referring the higher risk cases to other providers.

Physician groups could also attempt to achieve favorable selection in a bundling demonstration for an acute condition. This should be more difficult for the groups to accomplish and easier for HCFA to detect than corresponding behavior for a chronic condition, however, since professional ethics and the threat of malpractice would compel physicians to stabilize the condition of high risk acute cases before referring them to another provider. If the physician groups then try to bill Medicare under FFS for the initial care of patients with the condition covered under the demonstration, this would alert HCFA to investigate the possibility that the patients had been "dumped" onto other providers. Furthermore, if the condition is one for which patients would be admitted to a hospital before being dumped onto another rovider, such inappropriate behavior should be detected by the Peer Review Organization (PRO).

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[6] Conversely, some physician groups might argue that because of their reputation for delivering high quality care, they might experience adverse selection.

For some conditions, it may be possible to identify risk adjustors that would result in more equitable payments under a bundling demonstration. If so, this should limit the ability of physician groups to achieve favorable selection. For example, if a severity of illness measure exists for the condition that is highly correlated with treatment costs, HCFA could create separate bundled payment rates for "low," "medium," and "high" severity cases. Physician groups could still try to achieve favorable selection by attracting the lowest risk patients within each severity category, but it would be more difficult than achieving favorable selection without a risk adjustor since it would require making finer distinctions among patients.

Out-of-Bundle Billing. Physician groups could attempt to increase their net revenues under a condition-based bundling demonstration by submitting FFS bills for some services that should have been provided under the bundled payment. In general, the potential for out-of-bundling billing is likely to be greatest for a chronic condition in which the physician managing the patient's care for that condition also treats the patient for other conditions. In this case, if the physician performs a test that is relevant to both conditions, it is clearly in the physician's financial interest to indicate that the test was performed for the "nonbundled" condition and submit a bill under FFS. Similarly, the physician has a financial interest to bill under FFS for any visits in which care is provided for both the bundled condition and another condition. Detecting out-of-bundle billing, and proving that it was not a legitimate billing practice, could be very burdensome for HCFA and its Part B carriers.

The potential for out-of-bundle billing should be less for acute conditions, since the relatively short period of treatment would give physician groups less opportunity to engage in this practice. Furthermore, in a bundling demonstration for an acute condition, HCFA could require that all visits provided by the physician group during a specified time period following the start of the acute episode of care be covered under the bundled payment rate rather than billed under FFS. However, tests and services that are clearly not related to the condition covered under the bundled rate could be billed under FFS.

Upcoding Patients Into Higher Cost Bundles. We previously discussed the possibility that for some conditions, HCFA might use a severity of illness measure to adjust the bundled payment rates. While the goal of such a risk adjustor would be to generate more equitable payment rates, it would introduce the possibility that some physician groups might try to game the system by coding patients in a higher severity category than is warranted, thereby obtaining higher bundled payments. It would therefore be necessary for HCFA to monitor the distribution of each group's Medicare patients by severity category over time to determine whether any groups exhibit a significant shift toward higher severity cases. If so, HCFA would need to investigate those groups--e.g., through a chart review--to determine whether the shift is real or whether it is the result of improper upcoding. In addition, HCFA could conduct chart audits of random samples of patients in the higher severity categories to determine whether upcoding is occurring.

4. Defining Enrollment and Disenrollment

In a bundling demonstration for a chronic condition, HCFA would need to develop rules for defining the concepts of "enrollment" and "disenrollment." In an enrollment-model design, the date of enrollment for beneficiaries would be determined by the date on which they submit the completed enrollment form. For payment purposes, it would be convenient for HCFA to designate beneficiaries' official enrollment dates as occurring on the first day of the month, as in done in the Medicare HMO program, so HCFA could make bundled payments on the basis of calendar time periods (e.g., monthly or quarterly). For beneficiaries who submit the enrollment form on a day other than the first of the month, HCFA could designate the official enrollment date as the first day of the following month and pay the physician group a prorated bundled rate for the portion of the first month that the beneficiary was enrolled.[7]

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[7] Alternatively, HCFA could allow the physician group to submit FFS claims for services provided to the beneficiary during the partial month prior to the official enrollment date. However, this would give

In a nonenrollment-model design, HCFA could classify Medicare beneficiaries as being "enrolled" in a treatment program offered by a demonstration physician group on the date, following demonstration startup, on which they first obtain care from the group for the specified condition. As with the enrollment-model design, official enrollment dates for payment purposes would be specified as occurring on the first day of a month, and physician groups would receive prorated bundled payments for initial, partial months. An alternative approach would be to ask the physician groups to submit lists of the Medicare patients they have been treating for the specified condition, and consider all of those beneficiaries as being enrolled in the group's treatment program. This is less desirable than the first approach mentioned, since some of the beneficiaries on the patient lists submitted by the physician groups may have switched physicians, moved out of the area, or died. In addition, the first approach has the advantage of only capturing Medicare beneficiaries who are actively obtaining care for the chronic condition from the group.

Under each model, HCFA would need to develop rules for determining on a continuing basis whether particular beneficiaries should be regarded as still enrolled and thus whether Medicare should continue making bundled payments for them. This would be particularly difficult for chronic conditions for which some beneficiaries might make relatively few visits during a given year. For example, consider a bundling demonstration for diabetes management. While Medicare patients with particularly severe cases and those who are suffering serious complications of their diabetes may make many visits during a given year, those whose diabetes is under control are likely to make many fewer visits. Based on input from national physician organizations, Medicare PROs, and panels of clinicians, Weiner et al. (1995) identified three recommended procedures, which should each be performed at least once per year, that would characterize optimal primary for diabetic patients: (1) glycosylated hemoglobin measurement, (2) ophthalmologic examination, and (3) total cholesterol measurement. Thus, Medicare patients whose diabetes is under

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the physician group an incentive to shift the timing of services forward to the initial (partial) month where feasible in order to have the services reimbursed under FFS rather than covered under the bundled rate.

control could receive optimal care for their diabetes through a single visit per year to a primary care physician (or endocrinologist) and a single visit per year to an ophthalmologist.

This would have important implications for a bundling demonstration for diabetes. For example, in an enrollment-model design, consider a beneficiary who makes an initial visit to a participating physician group to receive routine care for diabetes, formally enrolls with the group for diabetes management, but never returns for follow-up care. For how long should HCFA continue making bundled payments for that person? It would be reasonable to continue making bundled payments for at least a year, in the expectation that the beneficiary would return a year later for the recommended tests. But what if 18 months pass without the person making a return visit? Should HCFA then consider the person disenrolled--even though s/he might return to the designated physician group at a later time for treatment of diabetes?

In principle, HCFA could limit the definition of enrollees to beneficiaries who exceed a certain threshold number of visits per year. However, this would mean that physician groups would receive bundled payments only for their patients who are most expensive to treat and FFS payments for the others. Physician groups would rightly argue that this bias should be taken into account when HCFA sets the bundled payment rate. In addition, defining enrollees as those who exceed a minimum number of visits per year would introduce incentives for physician groups to game the system by encouraging their healthiest patients to come for more visits than is medically necessary in order to continue receiving bundled payments for them. Although we have used diabetes to illustrate the potential difficulties in determining how long Medicare should continue making bundled payments for a given beneficiary, we believe these issues would apply to many other chronic conditions as well.

These problems could be lessened, but not eliminated, by selecting a chronic condition for which beneficiaries require active treatment on an ongoing basis. As noted previously, Lee et al. (1992) suggested that bundling for cancer treatment deserves further study. They specified a payment model in which HCFA would make a bundled payment for each month that a Medicare patient receives active cancer treatment, which they defined as any month in which the patient receives chemotherapy or radiotherapy or visits the gatekeeping provider. The difficulty with this approach is that is would provide incentives for physicians to increase the number of months in which treatment is provided beyond what might be medically appropriate. For example, physicians would have a financial incentive to extend treatment over a longer period of time than may be medically appropriate--e.g., by continuing treatment longer than they otherwise would for patients whose cancer is entering a stage of remission. Physicians would also have an incentive to manipulate the scheduling of treatments and visits to ensure that at least one therapy session or visit occurs per month for each patient.

In a bundling demonstration for a chronic condition, HCFA would also need to monitor the addresses each month of beneficiaries who are being treated under the demonstration to identify those who move out of the service area of their demonstration physician group. Otherwise, HCFA could continue making bundled payments for many months after such beneficiaries move out of the area, while at the same time perhaps making FFS payments to providers in the beneficiaries' new area of residence for the condition covered under the demonstration. For chronic conditions that are not so debilitating as to preclude out-of-area travel, HCFA would also need to be aware of the potential difficulty of identifying "snowbirds"--i.e., beneficiaries who spend part of the year in one region of the country and the rest of the year in another region. If such beneficiaries are not identified, HCFA could continue making bundled payments all year for beneficiaries who spend only part of the year in one of the demonstration sites. In principle, snowbirds can be identified from the Medicare enrollment file if they officially change their address--e.g., if they change their address with the Social Security Administration (SSA). However, many snowbirds probably continue to have their Social Security checks deposited to a bank near their permanent residence, have their mail forwarded from their permanent residence to their winter residence, and thus never officially change their address with SSA or HCFA.

These problems would either be avoided or would be less serious in a bundling demonstration for an acute condition, primarily because of the shorter time frame over which treatment occurs. In addition, since HCFA would make a single bundled payment to a participating physician group for managing the acute condition of a beneficiary, rather than making periodic payments over an extended period as in the case of a chronic condition, HCFA would not face the difficult task of continuously monitoring the status of beneficiaries to determine if Medicare should continue making bundled payments on their behalf. However, HCFA would need to develop rules for dealing with patients who change providers during the course of an acute episode. For example, HCFA would need to develop a method of computing bundled payments for patients who are initially treated for the acute condition at one hospital and then transferred to a larger hospital that has the facilities and expertise to provide the necessary care.

5. Setting Bundled Payment Rates

The willingness of physician groups to participate in a demonstration of condition-based bundling and the effects of such a demonstration on Medicare program costs would depend on the method used to set bundled payment rates and the level at which those rates are set. On the one hand, HCFA could announce both the rate-setting methodology and the rates themselves, which might vary by geographic region, and then solicit interest from physician groups willing to accept those rates. Alternatively, HCFA could develop the rate-setting methodology and then ask demonstration applicants to propose a rate at which they would be willing to participate. For example, HCFA could provide the groups with an estimate of what Medicare spends on average for treatment of beneficiaries with the specified condition in their market area or region and then ask the groups to propose a rate at or below that level. Or HCFA could ask the groups to propose a rate, without providing them with such FFS estimates. Under either scenario, HCFA could either accept the proposed rates or enter into negotiations with the groups.

In developing rates for a condition-based bundling demonstration, HCFA would need to decide whether and how to adjust the rates for geographic differences in mean Medicare expenditures for treatment of the given condition. Such differences can result from geographic differences in a variety of factors, including practice costs (i.e., input costs), practice patterns, and population characteristics. A strong argument can be made for adjusting the bundled rates to account for geographic differences in practice costs, since not doing so would be a departure from Medicare's current method of setting physician payment rates and would therefore be viewed as unfair by physician groups.

To adjust the bundled rates to reflect geographic differences in practice costs only, HCFA could apply the geographic adjustment factors (GAFs) used in the Medicare Physician Fee Schedule. For a given service, the GAF is a weighted average of the geographic practice cost indices for the three relative value components of the fee schedule: (1) the opportunity cost of physician work, (2) practice expenses (other than malpractice), and (3) malpractice expenses.[8] Since the GAFs vary by service, they cannot be applied directly to a national bundled payment rate, which in general will represent payment for multiple services. Instead, in developing the national bundled rate from Medicare claims data, HCFA could identify the distinct services typically included in the bundle and then compute a GAF for the bundle as a weighted average of the GAFs for those services (where the weights reflect the relative contribution of each service to the bundle in terms of relative value units).

If the bundled rate for a given condition covers inpatient hospital care as well as physician services, the portion of the rate designed to cover inpatient costs should also be adjusted to account for geographic differences in input costs. For example, assume that 40 percent of the national mean Medicare payment for a given bundle consists of payments for inpatient care and 60 percent consists of payments for physician services. The inpatient portion of the bundle could be adjusted using the base payment amounts in the Medicare Prospective Payment System, which (1) differ depending on whether a hospital is in a large metropolitan area (greater than 1 million population), a small metropolitan area, or a nonmetropolitan area, and (2) are also adjusted to account for geographic differences in hospital wage rates. Thus, a geographic adjustment factor for the inpatient component of a bundled rate would be defined as the ratio of the base payment amount for the area to the national base payment amount.

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[8] The weights used in this calculation are the relative shares of the three relative value components for the service. Since these shares vary by service, the GAFs vary by service.

For some conditions, geographic differences in mean Medicare payments may be due in large part to geographic differences in physician practice patterns. For example, recent studies have documented significant geographic variation in the management of acute myocardial infarction (Pilote et al. 1995; Guadagnoli et al. 1995). To develop bundled rates that account for differences in practice patterns--as well as differences in practice costs, population characteristics, and other factors--HCFA could develop geographic adjustment factors that reflect geographic differences in mean Medicare expenditures per patient treated. This approach would offer important advantages for a demonstration in which participation by physician groups is voluntary. Otherwise, if HCFA adjusts the bundled rate for geographic differences in practice costs only, physician groups in areas where practice patterns are more resource intensive than average might consider the bundled rate inadequate and might be less likely to participate. Conversely, physician groups in areas where practice patterns are more conservative than average would be more likely to consider the bundled rate adequate (or even generous) and would therefore be more likely to participate.

This pattern of participation would not be desirable. To test the cost-containment potential of condition-based bundling, a demonstration should be conducted in a variety of different areas, including areas where physicians have more resource intensive practice patterns than average. The potential for cost savings may be particularly great in such "high cost" areas, so it would be important to determine whether physician groups in these areas are able to achieve cost efficiencies. Conversely, the potential for cost savings is likely to be lowest in areas where physicians already have conservative practice patterns. Thus, a demonstration focused on the latter types of areas would likely underestimate the cost savings that could be achieved through a national program in which all physician groups would participate.

On the other hand, in a permanent program of condition-based bundling, there may be good reasons) adjust payment rates to reflect geographic differences in practice costs only. If geographic differences in practice patterns are due to inappropriate practice patterns in some areas, HCFA could induce physicians in those areas to adopt more appropriate practice patterns through its setting of bundled rates. For example, if HCFA has evidence that the resource-intensive practice patterns of physicians in some geographic areas do not yield better patient outcomes, HCFA could provide incentives to those physicians to adopt more conservative practice patterns by adjusting bundled rates to account for geographic differences in practice costs but *not* for geographic differences in practice patterns.

An issue that would need to be addressed on a condition-by-condition basis is whether the payment mechanism should include outlier protection for physician groups. If the distribution of treatment costs for a given condition is skewed such that a relatively small percentage of patients account for a very high percentage of costs, physician groups could be exposed to excessive financial risk. If HCFA decided that outlier protection was necessary, it could charge the groups an actuarially fair premium (which would be deducted from the bundled payments) and make payments from the outlier pool when groups have patients that exceed a specified threshold of costs. To give the groups incentives to continue to manage the care of patients who exceed the outlier threshold, the outlier payments would be designed to cover only a portion of the costs above the threshold.

The final issue we consider is how bundled payment rates should be updated over time. The most straightforward approach would be to update the rates annually using the Medicare Physician Fee Schedule updates and, if the bundled rate includes inpatient care, the update to the PPS base payment amount. Fee schedule updates are developed separately for surgical services, primary care services, and other nonsurgical services, so it would be necessary to develop a weighted average of these three updates to apply to the bundled rate. The weights used in this calculation should be specified to reflect the relative contribution of the three types of services (in terms of relative value units) to the overall bundled rate, as determined from national Medicare claims data. If the bundled rate covers inpatient care as well as 'ysician services, the update to the bundled rate should be computed as a weighted average of the update based on the physician services component that we just described and the update to the PPS base payment amount. The weights in the latter calculation would reflect the relative contribution of physician services and inpatient care that were assumed when HCFA developed the overall bundled rate.

E. ADMINISTRATIVE BURDEN

We have already identified the key administrative burdens that would face HCFA under a condition-based bundling demonstration. To summarize, these include:

- Monitoring the FFS claims of beneficiaries whose care is being provided under the demonstration to determine whether Medicare made FFS payments for services that should have been provided under the bundled payment
- Monitoring physician groups to detect any gaming of the payment system through efforts to achieve favorable selection, out-of-bundle billing, and upcoding patients into higher cost bundles
- In the case of bundling for chronic conditions, continuously monitoring beneficiaries to determine whether they should be considered "enrolled" and thus whether Medicare should continue making bundled payments on their behalf

As discussed throughout the previous sections, we believe HCFA would face fewer administrative burdens in a bundling demonstration for an acute condition than for a chronic condition.

These additional administrative costs could be at least partially offset if condition-based bundling reduces the costs of submitting and processing claims. Since fewer claims would be submitted under bundling, these administrative savings could potentially accrue both to participating physician groups and to HCFA's claims processing intermediaries. In principle, a single claim could be submitted for the bundle of services used to treat a given acute condition, rather than separate claims being submitted by the hospital and each physician--and any other providers-- involved in the case. On the other hand, however, moving toward greater aggregation in billing could provide HCFA with less detailed information on the services provided, which could limit HCFA's ability to monitor quality of and access to care. Thus, we expect that HCFA would require that "bundle-level" claims retain much of the information currently included in FFS claims on the number and types of services provided, which could limit the amount of any administrative savings. Nevertheless, HCFA should consider the potential for administrative savings through more efficient billing as a possible benefit of condition-based bundling.

III. EMPIRICAL ANALYSIS

In this chapter, we use Medicare claims data to assess the suitability of selected medical conditions for a demonstration of condition-based bundling. We selected conditions for analysis based on the major selection criteria presented in the previous chapter, namely: (1) the condition should account for relatively high Medicare expenditures, (2) Medicare beneficiaries with the condition should be relatively homogeneous clinically, and (3) the condition should be sufficiently prevalent in the Medicare population so that physician groups, at least in larger metropolitan areas, would have enough cases per year to permit adequate risk-spreading. Drawing on the expertise of the two clinical consultants to the project, Knight Steel, M.D. and Robert Berenson, M.D., we selected six conditions for the analysis: three acute conditions (hip fracture, acute myocardial infarction [AMI], and septicemia) and three chronic conditions (heart failure, diabetes, and glaucoma).

Although our conceptual analysis in the previous chapter concluded that, in general, a bundling demonstration for a chronic condition would face more serious design obstacles than a bundling demonstration for an acute condition, we included both types of conditions in the empirical analysis. Our empirical analysis complements the conceptual analysis by investigating the magnitude of some of the conceptual problems we identified for chronic conditions. For example, our empirical analysis provides information on the extent to which Medicare beneficiaries undergoing treatment for the selected chronic conditions are also being treating for other chronic conditions and on the potential for "out-of-bundle" billing by providers.

An important focus of our empirical analysis is on assessing the extent of variation across patients in the costs to Medicare of treating each condition. The answer to this question provides insight into whether patients with the condition are relatively homogeneous clinically. Thus, if we find that Medicare costs for treatment of a given condition exhibit low to moderate variation across patients, this would strongly suggest that patients with the condition are relatively homogeneous in terms of their needs for care and that the condition is a potentially good candidate for bundling.

The converse is not necessarily true, however. If treatment costs for a given condition exhibit a greater degree of variation across patients, this may be due to (1) greater heterogeneity among patients in their needs for care, (2) differences across physicians in how they treat the condition, or (3) a combination of both factors. In this case, simulations can shed light on how much various physician groups would gain or lose under bundled payment relative to the current payment system, which is useful for assessing the likely acceptability of bundled payment to physicians. But additional information would be needed to determine whether a bundling demonstration would be appropriate for such a condition. For example, if much of the variation in treatment costs is due to differences in physician practice patterns, and if clinical studies indicate that the more conservative (i.e., less resource-intensive) method of treating the condition yields patient outcomes as good as or better than the more resource-intensive method, HCFA could consider a bundling demonstration in which the bundled rate is set at a level consistent with the costs of the more conservative treatment method. This would provide incentives for physician groups that currently use the more resource-intensive treatment method to adopt the more conservative method. Such groups are likely to be reluctant to voluntarily participate in such a demonstration, however.

This chapter contains five sections. In section A, we discuss the data sources and sample design for the analysis. In section B, we describe our approach to selecting conditions for the analysis, and in section C we described our approach to constructing analysis files for those conditions. In sections D and E, we present the results of our analysis of the selected acute conditions and chronic conditions, respectively.

A. DATA SOURCES AND SAMPLE DESIGN

The key data sources for this analysis are HCFA's denominator file, which is a simplified version of the Medicare enrollment database, and Medicare claims data from the National Claims History (NCH) file. We defined the analysis period as calendar year 1992, which was the most recent year for which complete

Medicare claims data were available at the time of our data request. Using the denominator file as the source of the sample frame, we selected a 5 percent random sample of the national Medicare population that was alive as of January 1, 1992. Thus, all beneficiaries in our sample were alive at the start of the analysis period.

The denominator file provided eligibility, demographic, and mortality data on each sample member. After selecting the sample from the denominator file, we obtained more current mortality data from the vital status file. We excluded from our sample any beneficiaries who were enrolled in a Medicare risk HMO, cost HMO, or health care prepayment plan at any time during calendar years 1991 or 1992. This restriction was imposed to ensure that we had complete Medicare claims data on our sample during the analysis year and the prior year. We also excluded from our sample any beneficiaries who did not have coverage for both Parts A and B of Medicare and those who were eligible for Medicare due to end-stage renal disease (ESRD). We excluded the latter group because of their special health care needs, and because ESRD was not one of the conditions selected for the analysis.[9] Although our sample includes beneficiaries who were under age 65 and entitled to Medicare due to disability, we subsequently decided to restrict the analysis to beneficiaries age 65 and over since this is more likely to yield samples that are relatively homogeneous in their needs for care, which is desirable under bundled payment.

We requested Part A and Part B Medicare claims data on our sample for services rendered in calendar years 1991 and 1992. Prior to making our data request, we consulted with staff at HCFA's Bureau of Data Management and Strategy (BDMS) to determine which claims files would best meet our needs. Based on their advice, we obtained claims for our sample from the following files maintained under the NCH system: (1) the MEDPAR file, which was our source of data on inpatient and skilled nursing facility (SNF) services; (2) the Physician/Supplier Part B Final Action Data from the NCH file; and (3) the Standard

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[9] At the beginning of the project, we were told by HCFA not to include ESRD as a condition for the analysis because HCFA was already planning a bundling demonstration for ESRD patients.

Analytic Files for hospital outpatient, home health, and hospice services. These files provided us with the necessary data on Medicare costs, diagnoses, and dates of service.[10]

B. SELECTION OF CONDITIONS FOR THE ANALYSIS

The first step in our selection of conditions for the analysis was to use the physician/supplier Part B claims data for our sample to identify conditions that account for relatively high Medicare Part B costs. Using the line-item ICD-9-CM diagnosis codes and Medicare payment amounts on the Part B claims, we ranked diagnosis codes by Medicare payment amounts and by number of line items on claims. We conducted this preliminary analysis using Part B claims on the initial sample we received from HCFA, prior to imposing the restrictions on the sample described above.[11] We identified the top-ranking 100 conditions, first classifying conditions by 3-digit diagnosis codes and then by 5-digit codes.

We provided tables presenting these rankings to our two clinical consultants and asked them to recommend conditions that would be good candidates for bundling, based on the criteria described above. Based on the consultants' recommendations, we selected six conditions for the analysis. The consultants recommended that we define conditions using 3-digit rather than 5-digit diagnosis codes because of concerns about missing and inaccurate values in the fourth and fifth digits. The conditions included in the analysis are hip fracture (code 820), acute myocardial infarction (AMI) (410), septicemia (038), glaucoma (365), heart failure (428), and diabetes (250).

With the possible exception of septicemia, these conditions should be familiar to most readers. Septicemia is a systemic disease associated with the presence and persistence of pathogenic microorganisms or their toxins in the blood. Many Medicare beneficiaries who acquire septicemia do so while being treated in a hospital for another condition. Between 1979 and 1987, the reported incidence of septicemia among the elderly increased by 162 percent (Cer s for Disease Control 1990). Factors which may account for this increase include: (1) an increase in the use of invasive devices (e.g., catheters) inside and outside the hospital setting may have placed patients at increased risk for septicemia, (2) improved medical technology may have increased the number of immunocompromised patients who are at risk for septicemia, and (3) physicians may have become better at diagnosing septicemia (CDC 1990). In 1992, septicemia was the tenth leading cause of death among the elderly (National Center for Health Statistics 1995).

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[10] Throughout this chapter, we use the terms "Medicare costs" and "Medicare payments" interchangeably to refer to the amount paid by Medicare for services provided to sample members.

[11] Because of the large volume of Part B claims for the full 5 percent sample, we limited this initial phase of the analysis to a randomly selected 20 percent subsample of that total sample, which yielded a 1 percent sample of the national Medicare population.

C. DEVELOPMENT OF ANALYSIS FILES

We constructed a separate analysis file for each condition, using a somewhat different file design for acute and chronic conditions. We begin by describing our approach to developing analysis files for chronic conditions and then describe how we modified the approach for acute conditions. After imposing the restrictions described above on our initial 5 percent sample of the Medicare population, we merged the denominator-file records for the sample with Part B physician/supplier claims and Part B outpatient hospital claims. Next, we searched the diagnosis codes on both types of Part B claims data for the sample to identify individuals who had at least one claim for the chronic condition during the first 180 days of 1992. We restricted this search to the first 180 days of 1992 so we could construct a 180-day observation period for each sample member starting on the date in 1992 s/he first received Part B services for the condition.

In examining diagnosis codes on Part B physician/supplier claims, we focused on line-item diagnosis codes rather than diagnosis codes in the header portion of the claim record. In principle, the line-item code should more accurately identify the diagnosis corresponding to the service identified in the line item. In addition, Lee et al. (1993) found that the reporting of diagnoses on Part B physician/supplier claims from the NCH file for 1992 was more complete in the line items of the claim record than in the header. Our manual inspection of physician/supplier claims revealed that on the vast majority of claims, the line-item diagnoses are identical to the principal diagnosis reported in the header portion of the claim. In examining diagnosis codes on Part B outpatient hospital claims, we focused on the principal diagnosis code in the header portion of the claim because outpatient claims do not contain line-item diagnosis codes.

To determine whether a particular individual should be included in our sample for a given chronic condition, we focused our search on diagnosis codes for services for which we were most confident in the completeness and quality of the diagnostic coding. In the case of physician/supplier claims, we focused on services provided directly by physicians (visits, consultations, surgical procedures, and so on). In particular, we did not examine line-item diagnoses for diagnostic radiology services, laboratory services, or supplies, materials, and other services represented by alphanumeric (Level II) codes in the HCFA Common Procedure Coding System (HCPCS).[12] We did not examine the line-item diagnoses for such services because we were concerned that inaccurate diagnosis codes for them might cause us to erroneously include some individuals in our sample who did not actually have the chronic condition of interest. After we identified individuals who had the condition, however, we included radiology services, laboratory services, and the services represented by Level II HCPCS codes in constructing the measures of service use and cost described below.

Because the information available for outpatient hospital claims differs from that for physician/supplier claims, we had to use a different approach to identify diagnosis codes on outpatient claims for which we could have reasonable confidence. We used the revenue center codes on the outpatient claim to identify the types of services that were provided, classified by major cost center within the hospital. In an effort to be as consistent as possible with the approach we just described for physician/supplier claims, we did not examine the diagnosis code on outpatient claims in which the revenue center codes indicated that the only services provided were diagnostic radiology or laboratory services. Thus, in determining whether individuals should be included in our sample for a given chronic condition, we examined the principal diagnosis on outpatient claims in which the revenue center codes indicated that services were provided by one or more of the following cost centers within the hospital: operating room, emergency room, clinic, ambulatory surgery, cardiac catheterization, oncology, IV therapy, radiotherapy, nuclear medicine, respiratory services, and physical therapy.

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[12] The HCPCS Level II codes capture services that are not included in the CPT coding system and consist primarily of services provided by medical supply companies and health care professionals other than physicians.

To simplify the discussion that follows, we use the term Part B "claim" to represent either an outpatient hospital claim or a line item on a physician/supplier claim. This reflects the fact that in processing data on physician/supplier claims, we focused on the individual line items. Thus, when we refer to Medicare costs, diagnoses, and dates of service on a physician/supplier claim, readers should understand that we are referring to these measures on the line item.

For the sample we identified for each chronic condition, we defined the "index claim" for each individual as the first Part B claim during the first 180 days of 1992 that contained a diagnosis code corresponding to the particular chronic condition. We defined measures of service use and Medicare costs for each sample member for two time periods: (1) the first 90 days from the initial date of service on the index claim, and (2) the first 180 days from the initial date of service on the index claim.[13] The specification of these time periods is somewhat arbitrary but follows the specifications used in other bundling studies (Mitchell et al. 1987; Lee et al. 1992). We derived service use and cost measures for the full range of Part A and Part B services using the claims data described above. For hospital stays that spanned the end-date of the 90- or 180-day periods, we allocated Part A costs based on the percentage of the stay that occurred within the period. For example, if half the days in a stay occurred within the 180-day period and half occurred after the end of that period, we allocated half of the Part A costs for that stay to the 180-day period.

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[13] Throughout this chapter, when we refer to the date of service on the index claim (or, more simply, the date of the index claim), we are referring to the initial date of service on the claim. This is termed the first expense date in the file documentation.

On the analysis file for each of the three selected chronic conditions, we constructed separate use and cost measures corresponding to services received for that condition (which we call the "index" condition), for related conditions (which are defined differently for each index condition), and for all other conditions. In addition, we constructed use and cost measures corresponding to services for which the diagnosis code was missing or invalid. We define the related conditions for each index condition below in section D.

We used the same basic method to construct analysis files for the acute conditions, but we modified our approach in several ways. First, we modified our approach to defining index claims so that an index claim would represent the beginning of an acute episode of care. To achieve that objective, we imposed the restriction that an index claim for a given acute condition must be preceded by a 90-day period during which there are no other Part B claims for the beneficiary for that condition. Thus, for example, when we observed a sample member with a Part B claim for hip fracture in early January 1992, we examined the Part B claims for that person over the previous 90 days (using 1991 claims data) to determine whether the person's episode of care for hip fracture began in early 1992 or in the latter portion of 1991. If it began in 1991, we excluded that person from our hip fracture sample, since the claim we observed in early January 1992 did not capture the beginning of an acute episode of care and thus did not meet our definition of an index claim.

For each acute condition, we constructed use and cost measures for each sample member for a 180-day period beginning with the date of service on the index claim. We also constructed measures of Part B costs for the six 30-day periods comprising the total 180-day observation period for each individual. We constructed the latter variables to enable us to examine the distribution of costs over time throughout our 180-day observation period and to determine how the length of the episode of care varies across beneficiaries and across conditions.

After constructing analysis files for the three acute conditions in this manner, we decided to restrict the analysis of hip fracture and AMI patients to beneficiaries in the sample who were hospitalized for the condition. We had not originally imposed that restriction in constructing our analysis files because we wanted our analysis to replicate the operation of a bundling system in which the patients covered under the bundled payment would be determined by the diagnoses coded on their claims, without regard to the type of care they received or the setting in which the care was delivered. But we became concerned that unless we limited the hip fracture and AMI samples to beneficiaries who were hospitalized for the condition, our analysis might include beneficiaries who either (1) did not have these conditions during our observation period but had claims in which the diagnosis was incorrectly coded as hip fracture or AMI; or (2) had a follow-up visit in early 1992 for a hip fracture or AMI episode that began in 1991 but had not had another visit for the condition within the previous 90 days.[14]

For our analysis of hip fracture, we restricted the sample to beneficiaries who were hospitalized within 30 days of the index claim with a principal diagnosis of hip fracture. This restriction reduced the size of the hip fracture sample from 6,527 to 4,522. The specification that the hospital admission occurred within 30 days of the index claim was not based on clinical considerations but rather on the fact that hospital data were available on our analysis file for the initial 30-day period. The majority of the individuals who were excluded from our hip fracture sample because of this restriction had relatively low Part B costs for treatment of hip fracture during the 180-day observation period. Forty-nine percent had Part B costs of less than $100, and 18 percent had Part B costs between $100 and $250. However, 15 percent had Part B costs for treatment of hip fracture of over $1,000. The difficulty of identifying genuine hip fracture patients strictly from diagnosis codes on Part B claims is an issue that would need to be addressed in a bundling demonstration.

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[14] Recall from our definition of index claims for an acute condition that if a beneficiary had a Part B claim for the condition in early 1992 but had other claims for the condition within the previous 90 days, we would have considered the claim in 1992 to be part of the episode that began in 1991. Therefore, we would not have included it as an episode of care in our analysis.

For the analysis of AMI, we restricted the sample to beneficiaries who were either (1) hospitalized for at least five days with a principal diagnosis of AMI within 30 days of the index claim, or (2) were hospitalized for a shorter period because they died. This restriction was designed to approximately mirror the restriction imposed by the AMI Patient Outcomes Research Team (PORT), which excluded beneficiaries from its sample who were discharged alive in less than five days after admission for AMI because of a concern that such individuals were likely to have been incorrectly coded as having AMI (Guadagnoli et al. 1995; Mitchell et al. 1994). This restriction reduced the size of our AMI sample from 10,921 to 4,335.

The AMI PORT's concern that beneficiaries coded as having had an AMI may have been incorrectly coded as such if they were discharged from a hospital alive in less than five days has serious implications for a bundling demonstration for AMI. If HCFA implements a bundling demonstration in which it pays a bundled rate for all Medicare patients coded as having an AMI, it may inadvertently bundle genuine AMI patients with patients who were incorrectly coded as having an AMI. This could result in payment inequities. On the other hand, however, it would not be appropriate to use the rule adopted by the AMI PORT to identify genuine AMI patients for a bundling demonstration, since this might give physicians an incentive to extend the length of stay for their (possibly incorrectly coded) AMI patients to at least five days in order to receive the full bundled rate for an AMI case. These consideration suggest that if HCFA were to implement a bundling demonstration for AMI, it would need to develop more reliable methods of identifying patients who had in fact suffered an AMI.

D. ANALYSIS OF SELECTED ACUTE CONDITIONS

We begin by presenting a variety of descriptive statistics on the beneficiary samples for the three acute conditions, and we then present the findings of more in-depth analysis and simulations on the condition that appears to hold the most promise for a bundling demonstration.

1. Descriptive Statistics

Medicare beneficiaries treated for hip fracture in 1992 were older on average than those treated for septicemia or AMI. Sixty-five percent of hip fracture patients were at least 80 years of age, and 39 percent were at least 85 years of age (Table III.1). By comparison, beneficiaries age 85 and over accounted for 11.2 percent of total aged Medicare population in 1992 (HCFA 1994). Septicemia patients had the highest mortality rate in our observation period; 20 percent died within 30 days of the date of service on the index claim and 38 percent died within 180 days. This high mortality rate is within the range reported in the literature for septicemia patients (Pittet et al. 1994).

The costs to Medicare of treating hip fracture exhibited much less variation across patients than the costs of treating AMI or septicemia (Table III.2). The Medicare costs presented in the table are those on Part B claims and claims for inpatient hospital services for which the principal diagnosis was the condition of interest and which represented services received during the first 180 days beginning with the date of service on the index claim. The fact that treatment costs for hip fracture, which usually requires surgical treatment, exhibit less variation than treatment costs for the two medical conditions, AMI and septicemia, is not unexpected since the surgeon receives a global fee that covers the surgery itself plus postoperative care for 90 days. Thus, some degree of bundling already exists in Medicare's payment for hip fracture patients. Our analysis is intended to assess the feasibility of bundling all the other Part B costs for treating hip fracture with the surgeon's fee, and perhaps also bundling these Part B costs with inpatient hospital costs and, as we discuss below, the costs of post-acute care.

TABLE III.1

PROFILE OF MEDICARE BENEFICIARIES TREATED IN 1992 FOR SELECTED ACUTE CONDITIONS

	Hip Fracture	Acute Myocardial Infarction	Septicemia
Age (% Distribution)			
65-69	4.7	19.1	11.8
70-74	12.2	24.4	17.7
75-79	18.4	24.0	21.8
80-84	25.4	18.8	20.7
85 and over	39.2	13.8	27.9
Race (% Distribution)			
White	93.1	90.7	84.4
Black	3.6	5.1	11.3
Other	1.1	1.6	1.6
Unknown	2.1	2.6	2.7
Percent Female	79.1	50.4	58.6
Mortality Rate			
Within 30 days of onset	6.8	18.6	19.6
Within 180 days of onset	17.1	27.0	37.8
Sample Size	4,522	4,335	6,045

NOTE: These data were derived from a 5 percent random sample of the national Medicare population. For each condition, the sample consists of beneficiaries whose index claim for the condition occurred during the first 180 days of 1992.

TABLE III.2

MEDICARE PAYMENTS FOR BENEFICIARIES TREATED FOR SELECTED ACUTE CONDITIONS

	Hip Fracture	Acute Myocardial Infarction	Septicemia
Part B Payments			
Mean	$1,539	$805	$276
Coefficient of Variation	0.54	1.03	2.01
Percentiles			
5th	386	75	3
25th	1,101	267	56
50th	1,367	517	141
75th	1,810	1,065	334
95th	3,017	2,467	926
Part B Payments Plus Inpatient Hospital Payments			
Mean	9,810	10,021	3,063
Coefficient of Variation	0.51	0.97	2.07
Percentiles			
5th	4,075	3,679	6
25th	7,717	5,376	72
50th	9,320	6,958	293
75th	11,195	10,730	5,467
95th	15,981	26,519	12,109

NOTE: The payments reflected in this table are for services received during the first 180 days following the date of the index claim and only include services for which the line-item diagnosis was the index diagnosis. Thus, for example, the Part B payments for the sample of hip fracture patients only include payments for services for which the line-item diagnosis was hip fracture.

The mean cost of Part B services for treating hip fracture patients was $1,539, while the mean cost of Part B services plus inpatient hospital care was $9,810. The coefficient of variation, which is the ratio of the standard deviation to the mean, was approximately 0.5 for each of these measures. It is important to keep in mind that the statistics in Table III.2 were obtained for a national sample of the Medicare population. Thus, the variation in the costs of treating hip fracture may reflect variation across patients in the severity of the fracture and in the presence of comorbidites and complications, geographic variation in Medicare payment rates, and geographic variation in physician practice patterns. To assess the role of the final two factors, we present the results of additional analyses below in which patients are classified by geographic region.

The mean cost of treating AMI patients was $805 for Part B services and $10,021 for the sum of Part B services plus inpatient hospital care. The coefficient of variation was approximately 1.0 for each of these cost measures for AMI, which was about twice as high as the coefficient of variation for the costs of treating hip fracture. The costs presented in Table III.2 for AMI patients only capture services for which AMI was the principal diagnosis. If the initial episode of care for AMI was followed by care for an underlying cardiovascular condition that may have contributed to the AMI, the costs of that continuing care are not captured in Table III.2 if the principal diagnosis code was not AMI. We adopted this rule in order to focus on the costs of the acute episode of care for AMI, which is what we assume would be covered under a bundling demonstration.[15]

Septicemia had the lowest mean Part B treatment cost of the three acute conditions examined ($276) and the greatest variation in costs across patients. The coefficient of variation was about 2.0 for each of the two cost measures presented in Table III.2. The much lower inpatient hospital costs for septicemia patients than for hip fracture and AMI patients is partly due to the fact that inpatient costs in the table only capture the costs of hospital stays for which septicemia was the principal diagnosis. Thus, the inpatient costs in Table III.2 do not include the costs of stays in which another condition was the principal diagnosis ut septicemia was a complication.

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[15] Below, we examine the Part B costs incurred for AMI patients for other cardiovascular conditions.

One of the potential difficulties with condition-based bundling is that, if the physician treating a patient for the "bundled" condition is also treating the patient for another condition, the physician may be able to game the system by "billing outside the bundle." That is, the physician may be able to submit FFS bills for some services that should have been covered under the bundled rate. We argued in Chapter II that physicians would have less opportunity to engage in this practice with acute conditions than with chronic conditions because of the shorter treatment period for acute conditions. To assess the potential for out-of-bundle billing for the three acute conditions included in our analysis, we examined the distribution of Part B costs by physician specialty for the index condition and for other conditions during the 180 days from the date of service on the index claim. This provides insight into the whether the physician managing the patient's care for the index condition may also be providing a substantial amount of care for other conditions, which would increase the potential for out-of-bundle billing.

As expected, the majority of the Part B payments to physicians for the treatment of hip fracture went to orthopedic surgeons. The mean Part B payment to orthopedic surgeons for treatment of hip fracture patients was $876 (Table III.3).[16] The hip fracture patients received a fairly limited amount of services from orthopedic surgeons for conditions other than hip fracture during our 180-day observation period. The mean Part B payment to orthopedic surgeons for treating other conditions for the hip fracture sample was $88. These data suggest that, for most patients, orthopedic surgeons would have fairly limited opportunity to engage in out-of-bundle billing. Patients also received a limited amount of care for their hip fracture from primary care physicians, with a mean payment of $52 for internists and $66 for

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[16] This mean was computed across all hip fracture patients in our sample, including the 8 percent of the sample that had no Part B costs for an orthopedic surgeon. Beneficiaries in the latter group were treated by physicians identified as general surgeons. The mean payment to general surgeons for treating hip fracture across the entire hip fracture sample was $25.

TABLE III.3

MEAN MEDICARE PAYMENTS, BY DIAGNOSIS CATEGORY, FOR BENEFICIARIES TREATED FOR SELECTED ACUTE CONDITIONS

(Numbers in Parentheses Are Coefficients of Variation)

	Hip Fracture Sample		Acute Myocardial Infarction Sample		Septicemia Sample	
	Index Diagnosis	Other Diagnoses	Index Diagnosis	Other Diagnoses	Index Diagnosis	Other Diagnoses
Total Part B Payments	$1,539 (0.54)	$1,486 (1.07)	$805 (1.03)	$2,446 (1.11)	$276 (2.01)	$2,401 (1.24)
Physicians/suppliers	1,376 (0.45)	1,281 (1.09)	728 (1.00)	2,203 (1,15)	258 (1.42)	2,092 (1.26)
Hospital Outpatient Departments	162 (3.57)	206 (2.55)	77 (4.24)	243 (2.33)	19 (19.85)	308 ([illegible].94)
Part B Payments to Physicians, By Specialty						
Orthopedic Surgery	876 (0.51)	88 (3.41)	NA	NA	NA	NA
Anesthesiology	118 (0.77)	34 (2.61)	7 (8.86)	88 (2.28)	2 (11.72)	45 (2.62)
Internal Medicine	52 (2.95)	242 (1.64)	140 (1.87)	252 (1.74)	98 (2.51)	348 (1.87)
Family/General Practice	66 (2.08)	117 (1.96)	68 (1.99)	104 (2.21)	42 (2.92)	126 (2.21)

TABLE III.3 *(continued)*

	Hip Fracture Sample		Acute Myocardial Infarction Sample		Septicemia Sample	
	Index Diagnosis	Other Diagnoses	Index Diagnosis	Other Diagnoses	Index Diagnosis	Other Diagnoses
Physical Medicine/ Rehabilitation	35 (3.65)	34 (3.88)	NA	NA	NA	NA
Cardiology	NA	NA	389 (1.59)	603 (1.62)	NA	NA
Thoracic/Cardiac Surgery	NA	NA	17 (12.02)	334 (2.75)	NA	NA
Part A Payments for Inpatient Hospital Care	8,271 (0.57)	2,841 (2.16)	9,216 (1.02)	3,921 (2.21)	2,786 (2.22)	7,469 (1,81)

NOTE: For each sample, only valid diagnoses were included in the definition of other diagnoses. The mean Part B payments for line items with a missing or invalid diagnosis were $213 for the hip fracture sample, $130 for the AMI sample, and $233 for the septicemia sample. In each sample, over 95 percent of the payments associated with a missing or invalid diagnosis were on claims from Part B suppliers rather than physicians or outpatient departments.

NA = Payments for the physician specialty were not included on the analysis file for this condition.

family/general practitioners. This may reflect initial care provided at the onset of the episode and/or follow-up care, but in any event the limited role of such physicians suggests they would have fairly limited opportunity for out-of-bundle billing.

Part B payments by physician specialty for treatment of AMI followed the expected pattern, with the majority of payments going to cardiologists and internists. Across the entire sample of AMI patients, the mean payment to cardiologists was $389 on claims for which the diagnosis was AMI and $603 on claims for which the diagnosis was a condition other than AMI. Thus, a demonstration in which the bundled payment was intended to cover only the acute episode of care for AMI would need to develop rules to ensure that physicians are consistent about the length of time during an episode of care they use the AMI diagnosis code and when they shift to another code. Another option would be for the bundled payment to cover all care for cardiovascular disease following the index claim for AMI, but this approach would encounter the design challenges we discussed in Chapter II regarding chronic conditions, since many of the underlying cardiovascular diseases are likely to be chronic in nature.

The key finding in Table III.3 concerning septicemia patients is that the mean Part B payment for treatment of septicemia ($276) is significantly smaller than the mean Part B payment for treatment of other conditions ($2,401). This reflects the fact that septicemia is usually acquired as a complication while patients are being treated for another condition. These data suggest that a bundling demonstration for septicemia would present significant opportunities for out-of-bundle billing. An alternative approach would be to bundle payment for septicemia with payment for the condition for which the patient was being treated when s/he acquired septicemia. Although we have not investigated that option in our empirical analysis, it may deserve further consideration. The goal of such a bundling model would be to provide incentives for physicians and hospitals to take steps to minimize the incidence of septicemia among their patients.

For all three acute conditions, the vast majority of the Part B payments for treating the condition were for services provided within the first 30 days of the index claim. Nearly 87 percent of all the Part B payments for treatment of hip fracture made on behalf of patients in the hip fracture sample were for claims in which the initial date of service was within 30 days of the index claim (Table III.4). The corresponding percentages for the AMI and septicemia samples are 92 and 82 percent, respectively.

A significant minority of hip fracture patients continued receiving Part B services for their hip fracture throughout our 180-day observation period. One-third of the patients received such services in days 61-90, and this declined to 25 percent in days 91-120, 17 percent in days 121-150, and 14 percent in days 151-180. (We measured days relative to the initial date of service on the index claim, which was day 1.) The Part B payments for hip fracture patients after the first 30 days of care appear consistent with follow-up care and rehabilitation. For example, among patients with positive Part B payments for hip fracture in days 91-120, the mean of such payments was $125. We observed similar means for the other 30-day periods following day 30.

A much smaller percentage of AMI and septicemia patients continued receiving Part B services for their respective conditions throughout the 180-day observation period. For example, only 7 percent of beneficiaries in the AMI sample had a Part B claim for AMI in days 91-120, while the corresponding percentage for septicemia was 5 percent. In the case of AMI, the findings presented above in Table III.3 suggest that many patients continued to be treated throughout the 180-day period for a cardiovascular disease other than AMI. In the case of septicemia, the large reduction in the percentage of patients treated for the condition after the first 30 days indicates that the disease runs a relatively short course in most patients.

2. Additional Analysis of Hip Fracture Patients

Hip fracture appears to be the most promising candidate for a bundling demonstration of the three acute conditions we examined. We base this assessment on the fact that (1) hip fracture patients exhibit

TABLE III.4

DISTRIBUTION OF PART B PAYMENTS ACROSS 30-DAY INTERVALS MEASURED FROM THE SERVICE DATE ON THE INDEX CLAIM FOR BENEFICIARIES TREATED FOR SELECTED ACUTE CONDITIONS

	Hip Fracture	Acute Myocardial Infarction	Septicemia
Percentage Distribution of Part B Payments Across All Patients with the Index Diagnosis			
Days 1-30	86.9	91.5	82.0
Days 31-60	5.7	4.0	7.7
Days 61-90	2.9	1.7	3.6
Days 91-120	2.0	1.3	2.8
Days 121-150	1.3	1.0	2.1
Days 151-180	1.1	0.5	1.9
Percent of Beneficiaries with Positive Part B Payments, By Time Period			
Days 1-30	100.0	100.0	97.9
Days 31-60	55.0	18.2	10.0
Days 61-90	33.3	9.0	6.1
Days 91-120	24.8	6.9	5.0
Days 121-150	17.4	4.5	3.9
Days 151-180	14.2	3.7	5.4
Mean Part B Payment By Time Period Among Those with Positive Payments for the Period			
Days 1-30	$1,337	$737	$231
Days 31-60	160	176	212
Days 61-90	134	154	162
Days 91-120	125	153	155
Days 121-150	116	183	149
Days 151-180	122	116	98

NOTE: The payments included in this table are for Part B services for which the line-item diagnosis was the index diagnosis. The time periods are measured from the date of service on the index claim and reflect the date on which the service was provided.

considerably less variation in treatment costs than patients with the two other acute conditions, which suggests they are relatively homogeneous clinically; (2) most hip fracture patients are treated by orthopedic surgeons, who do not provide much care to hip fracture patients for other conditions, on average, during the 180 day observation period; and (3) hip fracture patients had the highest mean Part B payments ($1,539) of the three conditions examined. Furthermore, the concerns of the AMI PORT discussed above regarding the difficulty of reliably identifying AMI patients from diagnosis codes on claims data raise serious questions about the appropriateness of AMI for a bundling demonstration.

In this section, we conduct additional analyses to assess how a bundling demonstration for hip fracture would operate. We examine three bundling models in which the services covered under the bundled rate are (1) Part B services only; (2) Part B services plus inpatient hospital care; and (3) Part B services, inpatient hospital care, and post-acute services. We include the final model as an option because a significant percentage of hip fracture patients use post-acute services. We found that 44 percent of the hip fracture patients in our sample used SNF services following hospital discharge, 45 percent used home health services, 71 percent used either SNF or home health services, and 4 percent used rehabilitation hospital services.[17]

To simplify the discussion, we use the term "total cost" of care for hip fracture to represent the sum of the costs for Part B services, inpatient services, and post-acute services during the 180-day observation period. The coefficient of variation for the total cost of care (0.54) is very similar to the values reported previously for Part B costs (0.54) and Part B plus inpatient costs (0.51). The following table compares the three cost measures on some key statistics:

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[17] The Prospective Payment Assessment Commission (ProPAC) reported similar findings from an analysis of 1990 Medicare claims data. ProPAC reported that 42 percent of hip fracture patients used SNF services, 40 percent used home health services, 5 percent used services of rehabilitation hospitals, and 30 percent had no use of any of these post-acute services (ProPAC 1994).

	Part B Costs	Part B Plus Inpatient Costs	Total Costs
Mean	$1,539	$9,810	$13,221
CV	0.54	0.51	0.54
Percentiles			
5th	386	4,075	5,181
25th	1,101	7,717	9,081
50th	1,367	9,320	11,722
75th	1,810	11,195	15,716
95th	3,017	15,981	25,568

We noted previously that part of the variation across patients in treatment costs for hip fracture may reflect geographic variation in Medicare payment rates and physician practice patterns, as well as variations across patients in severity of the fracture, complications, and comorbidities. To provide descriptive information on whether and how the costs of treating hip fracture vary with certain patient characteristics, we classified hip fracture patients by age, sex, region of residence, and population size of residence. For the final variable, we used data from the Area Resource File to classify each sample member as residing in either a large metropolitan area (defined as having a population of at least one million), a smaller metropolitan area, or a nonmetropolitan area. We chose these three categories of population size because DRG rates vary across these categories. These three categories will also capture some of the variation in physician payment rates across carrier localities as defined under the Medicare fee schedule.

For each of the three cost measures, the mean cost was highest in the largest metropolitan areas, followed in order by the smaller metropolitan areas and the nonmetropolitan areas (Table III.5). The mean cost in the largest metropolitan areas exceeded the mean cost in the nonmetropolitan areas by 31 percent for Part B costs, 30 percent for Part B costs plus inpatient costs, and 34 percent for total costs. Part of this differential undoubtedly reflects differences in Medicare payment rates. Costs also varied by region, with

TABLE III.5

MEDICARE PAYMENTS FOR HIP FRACTURE, BY PATIENT CHARACTERISTICS

	Sample Size	Part B Services		Part B Plus Inpatient Hospital Services		All Medicare Services[a]	
		Mean	CV	Mean	CV	Mean	CV
Total Sample	4,522	$1,539	0.54	$9,810	0.51	$13,221	0.54
Age							
65-69	213	1,383	0.37	9,352	0.37	12,175	0.46
70-74	554	1,496	0.48	9,616	0.41	12,586	0.49
75-79	835	1,595	0.57	9,967	0.41	13,468	0.48
80-84	1,149	1,544	0.52	10,236	0.73	13,998	0.66
85 and over	1,771	1,541	0.57	9,576	0.38	12,925	0.49
Sex							
Male	946	1,458	0.49	10,003	0.73	13,223	0.65
Female	3,576	1,560	0.55	9,760	0.43	13,221	0.51
Region							
Northeast	1,009	1,728	0.48	10,297	0.77	13,493	0.69
North Central	1,206	1,400	0.52	9,382	0.32	12,009	0.41
South	1,659	1,479	0.60	9,409	0.41	12,849	0.50
West	648	1,656	0.50	10,879	0.41	16,007	0.49
Population Size							
Largest metropolitan areas[b]	1,949	1,734	0.51	10,915	0.58	14,826	0.56
Other metropolitan areas	1,378	1,448	0.55	9,455	0.42	12,798	0.50
Nonmetropolitan areas	1,195	1,323	0.54	8,419	0.34	11,091	0.45

NOTE: The payments reflected in this table are for services received during the first 180 days following the date of the index claim. Only services for which the line-item diagnosis is the specified condition are included.

[a] Excludes hospice services.

[b] Largest metropolitan areas are defined as those with a population of at least 1 million.

the West and Northeast exhibiting the highest mean costs for each of the three measures. The regional variation in costs was greatest for total costs. The mean total cost of treating hip fracture in the West exceeded the other regional means by amounts ranging from 18 percent (for the Northeast) to 33 percent (North Central). Much of this differential in total costs is due to significantly higher costs for post-acute care in the West. Mean costs exhibited less variation across age subgroups than across subgroups based on region or population size, although a pattern of somewhat higher costs for the older age groups was discernible.

Because of the relatively small sample sizes in some of the subgroups in Table III.5, we investigated whether any of the subgroup means were unduly influenced by the presence of high-cost outliers. To investigate this, we constructed a trimmed version of the hip fracture sample. For each of the three cost measures of interest (Part B, Part B plus inpatient, and total), we defined a trimmed version of the sample by finding the 95th percentile of the cost measure, finding the sample members whose costs exceeded the 95th percentile, and then replacing the actual cost value for such individuals by the value defining the 95th percentile. Thus, in the trimmed sample, costs were "capped" so that no individual's costs were allowed to exceed the 95th percentile. This reduces the influence of high-cost outliers in comparisons of means across patient subgroups. The mean costs we computed for the trimmed version of the sample, which are displayed in Table III.6, yielded the same basic conclusions as those discussed above for the untrimmed sample concerning variations in costs by geographic region and population size.

To investigate how a bundling demonstration for hip fracture would operate in practice, we conducted simulations on our sample by computing a bundled rate for each hip fracture patient and comparing the bundled rate with the amount that Medicare actually paid for the beneficiary's care. The focus of this analysis is not on comparing the two values for individual patients, but rather on investigating how physician groups with a moderate to large number of hip fracture patients would fare under a bundled payment system relative to the existing payment system.

TABLE III.6

MEDICARE PAYMENTS FOR HIP FRACTURE, BY PATIENT CHARACTERISTICS (TRIMMED SAMPLE)

	Sample	Part B Services		Part B Plus Inpatient Hospital Services		All Medicare Services[a]	
		Mean	CV	Mean	CV	Mean	CV
Total Sample	4,522	$1,485	0.44	$9,473	0.32	$12,824	0.42
Age							
65-69	213	1,383	0.37	9,198	0.32	12,013	0.42
70-74	554	1,465	0.41	9,372	0.32	12,325	0.43
75-79	835	1,527	0.43	9,652	0.32	13,151	0.42
80-84	1,149	1,499	0.44	9,587	0.33	13,270	0.42
85 and over	'71	1,476	0.46	9,379	0.32	12,634	0.42
Sex							
Male	946	1,432	0.43	9,432	0.33	12,706	0.43
Female	3,576	1,500	0.44	9,484	0.32	12,855	0.42
Region							
Northeast	1,009	1,674	0.40	9,516	0.41	12 846	0.48
North Central	1,206	1,362	0.42	9,285	0.28	11,899	0.38
South	1,659	1,411	0.45	9,172	0.29	12,499	0.41
West	648	1,611	0.44	10,520	0.29	15,342	0.38
Population Size							
Largest metropolitan areas[b]	1,949	1,664	0.42	10,362	0.31	14,187	0.40
Other metropolitan areas	1,378	1,401	0.43	9,184	0.30	12,503	0.42
Nonmetropolitan areas	1,195	1,291	0.43	8,356	0.31	10,970	0.41

NOTE: The payments reflected in this table are for services received during the first 180 days following the date of the index claim. Only services for which the line-item diagnosis is the specified condition are included. The trimmed sample was defined by identifying sample members whose payments exceeded the 95th percentile and replacing their actual payment amount with the value defining the 95th percentile.

[a] Excludes hospice services.

[b] Largest metropolitan areas are defined as those with a population of at least 1 million.

For example, assume HCFA sets the bundled rate at a fixed percentage (say, 95 percent) of the mean cost it pays for hip fracture patients under the current payment system. Thus, physician groups participating in a bundling demonstration for hip fracture would expect to receive bundled payments that, on average, are 5 percent below the payments they would receive under the current system. If the simulations indicate that most or all physician groups would receive bundled payments that, in total, are approximately 5 percent below the total Medicare payments they would have received for their hip fracture payments under the current system, this would suggest that the bundled payment system would not expose them to excessive financial risk. Thus, the losses the groups would experience for some patients would be roughly offset by gains on other patients so that, in the aggregate, the groups would receive bundled payments that are about 5 percent below the payments they would have received under the current system.

However, if the simulations indicate that some physician groups would experience losses much greater than 5 percent under the bundled payment system while others would experience gains, this would suggest that the bundled payment system could expose them to excessive financial risk. If physician groups experience large financial losses, they may become dissatisfied and withdraw from the demonstration--and perhaps even skimp on care before withdrawing.

By comparing bundled payments with payments received under the existing Medicare payment system, the simulations provide only a partial measure of how physician groups would fare under bundled payment. This measure is important, however, because it is likely to determine the willingness of physician groups to participate in a demonstration. In a permanent, mandatory program of bundling for hip fracture, physician groups would be likely to respond to the bundled payment by becoming more efficient and reducing their resource costs of treating hip fracture patients. Thus, a group's net revenues under a permanent program would depend in part on its ability to achieve cost efficiencies. We have not incorporated any assumptions about the ability of groups to achieve such efficiencies in our simulations.

Our basic approach to the simulations was to use our sample of hip fracture patients to construct randomly selected patient groups of varying size, which we treated as the hip fracture patients of hypothetical physician groups. Given the small size of our sample (4,522), our first step was to replicate each observation in the sample 25 times to yield a much larger sample that had the same distributional characteristics as the original sample. From this larger sample, we then randomly selected six sets of 25 patient groups. The first set of 25 groups consisted of 50 patients per group, the second set consisted of 100 patients per group, and the number of patients per group in the remaining sets was 250, 500, 1,000, and 2,500.

Before randomly selecting beneficiaries for the groups, we first stratified the sample by geographic region. We then selected patients for the groups such that each group consisted of patients drawn from a single region. Specifically, of the 25 groups in each set, we specified that 5 groups treated patients in the Northeast, 7 in the North Central, 9 in the South, and 4 in the West. This distribution of groups approximately matches the distribution of hip fracture patients across the four regions. We followed this approach because of the evidence presented above concerning the variation in treatment costs by region. If we had not stratified patients by region in the selection process, a typical group would have included hip fracture patients from all four regions of the country.

We used the six sets of 25 patient groups selected in this manner to simulate the effects of a bundling demonstration for hip fracture involving 25 physician groups--5 in the Northeast, 7 in the North Central, 9 in the South, and 4 in the West. We conducted simulations for each of the three cost measures defined above. In the first set of simulations, we specified a national bundled rate for each cost measure. Thus, we did not adjust the bundled rate to account for regional differences in Medicare payment rates or practice patterns. We set the bundled rate for each cost measure equal to the mean cost for the entire sample of hip fracture patients. Such a rate would be expected to yield budget neutrality for Medicare in the initial year of a demonstration conducted on a random sample of the national Medicare hip fracture population.[18]

We set the national bundled rate at this level to simplify the discussion of the simulations--i.e., to assess how well physician groups fare under the simulated bundled payment relative to payments under the existing system, and to classify groups as "winners" or "losers" based on that comparison. We could just as easily have set the bundled rate at, say, 95 percent of the mean cost for the national population and then examined how well physician groups fare relative to the expectation of receiving 95 percent of the payments made under the existing system.

The first set of simulations we discuss assumed that only Part B services are covered under the bundled payment. In comparing simulated bundled payments with the payments that Medicare actually made for sample members, we refer to the latter as "actual payments." In the simulation that assumed 250 hip fracture patients per group, the mean result across groups was a gain of $11 per patient under bundled payment relative to actual payments, which was an average revenue gain of 1.4 percent (see the third column in Table III.7). The maximum gain and the maximum loss by a group were each 13.9 percent of the actual payments they received.

Sixty-eight percent of the groups met our definition of breaking even under bundled payment--i.e., the bundled payments they received were within 10 percent of the actual payments. We classified 20 percent of the groups as winners and 20 percent as losers, which we defined as receiving bundled payments at least 10 percent greater than and 10 percent less than actual payments, respectively. The mean gain among groups classified as winners was 12.2 percent, while the mean loss among those classified as

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[18] However, the samples used in our simulations are allocated by region in proportion to the number of physician groups we assigned to the regions. Since the latter are integers, which do not precisely represent the distribution of patients in the total hip fracture sample by region, a national bundled rate for the samples used in the simulations would be expected to yield a result close to (but somewhat different than) overall budget neutrality.

TABLE III.7

GAINS AND LOSSES FOR SETS OF 25 RANDOMLY DRAWN PATIENT GROUPS OF DIFFERING SIZE: HIP FRACTURE
(National Payment Rates)

	Number of Patients Per Group					
	50	100	250	500	1,000	2,500
Bundled Payment for Part B Services						
Gain (loss) per group in dollars per patient						
Mean	15	12	11	13	-3	2
Maximum gain	271	265	188	153	158	168
Maximum loss	-370	-293	-248	-175	-244	-218
Percentage gain (loss) per group						
Mean	2.2	1.9	1.4	1.3	0.4	0.9
Maximum gain	21.4	20.8	13.9	11.1	11.5	12.3
Maximum loss	-19.4	-16.0	-13.9	-10.2	-13.7	-12.4
Percentage of groups that:						
Are winners	24.0	28.0	20.0	8.0	12.0	12.0
Break even	56.0	48.0	68.0	88.0	72.0	68.0
Are losers	20.0	24.0	20.0	4.0	12.0	20.0
Mean gain among winning groups						
Dollars per patient	212	206	167	147	151	157
Percentage	16.1	15.6	12.2	10.6	10.9	11.4
Mean gain (loss) among groups that break even						
Dollars per patient	25	11	3	9	15	36
Percentage	2.0	0.9	0.6	1.0	1.3	2.7
Mean loss among losing groups						
Dollars per patient	-249	-211	-206	-175	-199	-206
Percentage	-13.8	-12.0	-11.8	-10.2	-11.4	-11.8

TABLE III.7 (*continued*)

	Number of Patients Per Group					
	50	100	250	500	1,000	2,500
Bundled Payment for Part B Plus Inpatient Hospital Services						
Gain (loss) per group in dollars per patient						
Mean	-298	96	-87	18	46	4
Maximum gain	1,175	1,137	628	631	638	538
Maximum loss	-3,888	-1,588	-1,583	-1,363	-1,159	-1,115
Percentage gain (loss) per group						
Mean	-2.0	1.5	-0.5	0.5	0.8	0.4
Maximum gain	13.6	13.1	6.8	6.9	7.0	5.8
Maximum loss	-28.4	-13.9	-13.9	-12.2	-10.6	-10.2
Percentage of groups that:						
Are winners	12.0	8.0	0.0	0.0	0.0	0.0
Break even	72.0	84.0	88.0	96.0	92.0	92.0
Are losers	16.0	8.0	12.0	4.0	8.0	8.0
Mean gain among winning groups						
Dollars per patient	1,094	1,029	-	-	-	-
Percentage	12.6	11.8	-	-	-	-
Mean gain (loss) among groups that break even						
Dollars per patient	-123	153	87.5	75.6	148.7	100.2
Percentage	-1.0	1.9	1.1	1.0	1.8	1.3
Mean loss among losing groups						
Dollars per patient	-2,131	-1,430	-1,365	-1,363	-1,138	-1,107
Percentage	-17.3	-12.7	-12.2	-12.2	-10.4	-10.1
Bundled Payment for All Medicare Services						
Gain (loss) per group in dollars per patient						
Mean	-329	59	-165	40	17	-32
Maximum gain	1,735	1,980	1,478	1,151	1,743	1,343
Maximum loss	-4,052	-4,090	-3,577	-3,152	-2,858	-2,980

TABLE III.7 *(continued)*

	Number of Patients Per Group					
	50	100	250	500	1,000	2,500
Percentage gain (loss) per group						
Mean	-1.5	1.6	-0.3	1.1	1.0	0.7
Maximum gain	15.1	17.6	12.6	9.5	15.2	11.3
Maximum loss	-23.5	-23.6	-21.3	-19.2	-17.8	-18.4
Percentage of groups that:						
Are winners	8.0	20.0	12.0	0.0	20.0	16.0
Break even	76.0	64.0	72.0	84.0	64.0	68.0
Are losers	16.0	16.0	16.0	16.0	16.0	16.0
Mean gain among winning groups						
Dollars per patient	1,563	1,616	1,352	-	1,376	1,296
Percentage	13.4	14.0	11.4	-	11.6	10.9
Mean gain (loss) among groups that break even						
Dollars per patient	0	318	164	556	267	323
Percentage	0.3	2.7	1.5	4.5	2.2	2.6
Mean loss among losing groups						
Dollars per patient	-2,838	-2,923	-2,783	-2,669	-2,681	-2,871
Percentage	-17.3	-17.9	-17.2	-16.8	-16.8	-17.8

NOTE: The gain (loss) for a given group was computed as BP-AP where BP is the total bundled payments that would have been made for the patients in the group and AP is the actual payments that were made for those patients.

[a] A group is defined as a winner if its total bundled payments exceed its actual payments by at least 10 percent, and it is defined as a loser if its total bundled payments are at least 10 percent below its actual payments. A group is defined as breaking even if its bundled payments are within 10 percent of its actual payments.

losers was 11.8 percent. Thus, most groups received simulated bundled payments for Part B services that were relatively close to the actual payments they received.

The simulations of a national bundled payment rate for Part B services resulted in differential effects across regions, however. As the number of patients per group increases from 250 to 2,500, the maximum gain per group remains in the range of 11 to 12 percent, and the maximum loss remains in the range of 10 to 14 percent. Thus, the greater risk-spreading that results from increased patient loads does not reduce the size of these gains or losses. Although the table doesn't show this, the reason is that groups in some regions consistently tend to lose, and groups in other regions consistently tend to gain, under a national bundled payment rate. For example, groups in the Northeast and West tend to lose under such a system because the mean Part B costs in those regions are 12 percent and 8 percent higher, respectively, than the overall mean for the sample (see Table III.5 above). Conversely, groups in the North Central and South gain under such a payment system because the mean Part B costs in those regions are 9 percent and 4 percent lower, respectively, than the overall mean for the sample.

When the bundled rate was defined as covering both Part B services and inpatient hospital services, the mean result across groups was a revenue loss of $87 per patient, or 0.5 percent (again, we are focusing on the simulations that assumed 250 hip fracture patients per group). Eighty-eight percent of the groups were classified as breaking even, 12 percent were classified as losers, and none were classified as winners. The mean loss among losing groups was 12.2 percent. The maximum loss per group remains in the range of 10 to 12 percent as the number of patients per group increases from 250 to 2,500, which again is due to differential effects by region. Groups in the West consistently lose under this bundling arrangement, since the mean of Part B plus inpatient costs in the West is about 11 percent higher than the overall mean for the sample.

When the bundled rate is defined as covering the total costs of treating hip fracture patients, our simulations assuming 250 patients per group yielded a mean loss across groups of 0.3 percent. Once again, however, groups in different regions are affected much differently. The groups in California consistently lose under this payment system, with losses in the range of 17 to 18 percent regardless of the number of patients per group. Conversely, groups in the North Central consistently gain under this payment system because of the lower than average costs in that region.

It is not clear whether these differential effects by region would be inequitable. A portion of the regional differences in what Medicare currently pays for hip fracture patients may reflect differences in Medicare payment rates, which are intended to capture underlying differences in input costs. However, if the goal of bundling is to give providers incentives to become more efficient, then physician groups in areas where input costs are currently relatively high may be best able to respond to those incentives by reducing input costs -- e.g., by negotiating lower payment rates (or salaries) with physicians, negotiating more aggressively for office space, and so on. Thus, it is not clear that a bundling demonstration should accept current regional differences in input costs as fixed. In addition, part of the regional differences in the costs to Medicare of treating hip fracture patients may be due to regional differences in physician practice patterns that may not be justifiable. A national bundled rate would give physicians incentives to adopt more uniform practice patterns, which ideally would be based on practice guidelines developed from outcomes research.

In the next set of simulations, we specified bundled payment rates that vary by region. To develop regional payment rates, we developed a set of adjustment factors from the mean costs computed for the trimmed version of our sample defined previously. We used the trimmed version of the sample to reduce the influence of high-cost outliers in developing regional adjustment factors. For each of the three cost measures, we derived an adjustment factor for each region by dividing the trimmed mean for the region by the trimmed mean for the overall sample. For example, using the values reported above in Table III.6, the adjustment factor for the Northeast for Part B plus inpatient hospital costs is (\$9,516)/(\$9,473), which is 1.0045. To compute the bundled rate for Part B plus inpatient hospital services for the Northeast, we multiplied this adjustment factor by the (untrimmed) mean Part B plus inpatient hospital cost for the total sample ($9,810), which yields a rate of $9,854.[19]

Under the simulations based on the regional payment rates, physician groups were more likely to receive bundled payments that were very close to their actual payments. For example, under each of the three bundling models (corresponding to the three different cost measures), all physician groups were classified as breaking even in the simulations that assumed at least 250 patients per group (Table III.8). Even in the simulations that assumed only 100 patients per group, the vast majority of groups broke even under each bundling model. For example, in those simulations, 96 percent of the groups were classified as breaking even under bundled payment for Part B plus inpatient services, as well as for all hip fracture services.

It is particularly noteworthy that the bundling model that includes Part B, inpatient, and post-acute services yielded results that are very similar to those of the other two models in terms of percentage gains and losses relative to current payments. For example, in the simulations that assumed 250 patients per group, the bundling model that includes all three types of services yielded a mean loss across groups of 0.8 percent. The maximum gain and maximum loss for any group under this model were 5.0 percent and 6.3 percent, respectively. In comparison, the bundling model that only includes Part B plus inpatient services yielded a mean loss across groups of 0.6 percent, a maximum gain of 3.4 percent, and a maximum loss of 8.0 percent.

Under the regionally-adjusted bundled rates, physician groups received bundled payments that were closer to their actual payments than what they received under the national bundled rates. Regionally-adjusted rates would therefore be preferred by physician groups in regions where Medicare's mean cost of treating hip fracture patients is currently relatively high. As noted above, however, the regional

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[19] We used the untrimmed mean for the total sample in this calculation since we have assumed that the total costs of treating high-cost outliers would be covered under the bundled rates.

TABLE III.8

GAINS AND LOSSES FOR SETS OF 25 RANDOMLY DRAWN PATIENT GROUPS OF DIFFERING SIZE: HIP FRACTURE

(Regional Payment Rates)

	Number of Patients Per Group					
	50	100	250	500	1,000	2,500
Bundled Payment for Part B Services						
Gain (loss) per group in dollars per patient						
Mean	12	9	7	9	-7	-2
Maximum gain	251	153	136	67	40	41
Maximum loss	-201	-178	-92	-56	-69	-28
Percentage gain (loss) per group						
Mean	1.4	1.0	0.5	0.5	-0.4	-0.1
Maximum gain	17.8	10.8	8.9	4.0	2.4	3.0
Maximum loss	-12.1	-10.9	-5.9	-3.8	-4.5	-1.9
Percentage of groups that:						
Are winners	20.0	4.0	0.0	0.0	0.0	0.0
Break even	72.0	92.0	100.0	100.0	100.0	100.0
Are losers	8.0	4.0	0.0	0.0	0.0	0.0
Mean gain among winning groups						
Dollars per patient	202	137	-	-	-	-
Percentage	14.5	10.8	-	-	-	-
Mean gain (loss) among groups that break even						
Dollars per patient	-19	11	7	9	-7	-2
Percentage	-0.8	1.1	0.5	0.5	-0.4	-0.1
Mean loss among losing groups						
Dollars per patient	-189	-178	-	-	-	-
Percentage	-11.5	-10.8	-	-	-	-

TABLE III.8 (*continued*)

	Number of Patients Per Group					
	50	100	250	500	1,000	2,500
Bundled Payment for Part B Plus Inpatient Hospital Services						
Gain (loss) per group in dollars per patient						
Mean	-281	113	-70	35	62	20
Maximum gain	1,154	966	348	361	394	334
Maximum loss	-3,842	-869	-861	-598	-456	-537
Percentage gain (loss) per group						
Mean	-1.9	1.4	-0.6	0.4	0.7	0.3
Maximum gain	12.0	10.9	3.4	3.9	4.3	3.6
Maximum loss	-28.1	-8.1	-8.0	-5.7	-4.4	-5.2
Percentage of groups that:						
Are winners	12.0	4.0	0.0	0.0	0.0	0.0
Break even	72.0	96.0	100.0	100.0	100.0	100.0
Are losers	16.0	0.0	0.0	0.0	0.0	0.0
Mean gain among winning groups						
Dollars per patient	1,062	966	-	-	-	-
Percentage	11.7	10.9	-	-	-	-
Mean gain (loss) among groups that break even						
Dollars per patient	-103	77	-70	35	62	20
Percentage	-0.8	1.0	-0.6	0.4	0.7	0.3
Mean loss among losing groups						
Dollars per patient	-2,090	-	-	-	-	-
Percentage	-17.0	-	-	-	-	-
Bundled Payment for All Medicare Services						
Gain (loss) per group in dollars per patient						
Mean	-297	92	-133	72	50	0
Maximum gain	2,316	2,003	758	465	790	389
Maximum loss	-3,511	-1,495	-981	-556	-304	-385

TABLE III.8 *(continued)*

	Number of Patients Per Group					
	50	100	250	500	1,000	2,500
Percentage gain (loss) per group						
Mean	-1.7	1.1	-0.8	0.6	0.5	0.1
Maximum gain	17.2	17.8	5.0	3.7	6.9	3.3
Maximum loss	-21.0	-8.6	-6.3	-3.4	-2.3	-2.8
Percentage of groups that:						
Are winners	8.0	4.0	0.0	0.0	0.0	0.0
Break even	8.0	96.0	100.0	100.00	100.00	100.00
Are losers	12.0	0.0	0.0	0.0	0.0	0.0
Mean gain among winning groups						
Dollars per patient	2,037	2,003	-	-	-	-
Percentage	16.2	17.8	-	-	-	-
Mean gain (loss) among groups that break even						
Dollars per patient	-223	12	-133	72	50	0
Percentage	-1.6	0.4	-0.8	0.6	0.5	0.1
Mean loss among losing groups						
Dollars per patient	-2,277	-	-	-	-	-
Percentage	-14.8	-	-	-	-	-

NOTE: The gain (loss) for a given group was computed as BP-AP where BP is the total bundled payments that would have been made for the patients in the group and AP is the actual payments that were made for those patients.

[a] A group is defined as a winner if its total bundled payments exceed its actual payments by at least 10 percent, and it is defined as a loser if its total bundled payments are at least 10 percent below its actual payments. A group is defined as breaking even if its bundled payments are within 10 percent of its actual payments.

differences in mean costs under the current payment system may not be entirely equitable. If HCFA desired to reduce the magnitude of the regional differences in what it pays for hip fracture patients under a bundled payment system, it could develop bundled rates that represent a blend of national and regional cost levels. For example, bundled rates could be set by adjusting national rates to account for only half of the regional differences in the mean cost of treating hip fracture patients.

It is important to emphasize that our simulations were based on the assumption that hip fracture patients are assigned randomly to physician groups--i.e., there is no biased selection. In fact, however, some groups with highly specialized facilities, highly qualified physicians, and outstanding reputations may tend to attract the most difficult cases, while other groups may primarily attract the more routine cases. Thus, prior to proceeding with a demonstration, it would be important to assess the case-mix of the hip fracture patients treated by potential demonstration participants.

If there are significant differences in case-mix, some method of risk-adjusting the bundled payment rate would be necessary. One possible approach would be to adjust the payment rate depending on the DRG to which the patient was assigned. Patients with hip replacements or hip fractures that require surgical treatment are classified into one of four surgical DRGs (209, 210, 211, or 471), and patients with a hip fracture that does not require surgery are classified into one medical DRG (236) (ProPAC1994). The disadvantage of this approach is that it would give physicians incentives to increase their bundled payment rate by coding their patients into higher cost DRGs. But this is a potential problem under any risk adjustment method that depends on case-mix information supplied by the provider.

E. ANALYSIS OF SELECTED CHRONIC CONDITIONS

In this section, we present the results of our analyses of the three chronic conditions: heart failure, diabetes, and glaucoma. The heart failure patients were older on average than the diabetes and glaucoma patients (Table III.9). Half of the heart failure patients were at least 80 years of age, compared with 31 percent of the glaucoma patients and 23 percent of the diabetes patients. Heart failure patients had the

TABLE III.9

PROFILE OF MEDICARE BENEFICIARIES TREATED IN 1992 FOR SELECTED CHRONIC CONDITIONS

	Heart Failure	Diabetes	Glaucoma
Age (% Distribution)			
65-69	10.8	24.6	18.4
70-74	17.7	29.0	25.8
75-79	21.8	23.0	24.8
80-84	21.7	14.1	17.6
85 and over	28.0	9.3	13.4
Race (% Distribution)			
White	87.5	83.0	85.7
Black	8.8	11.8	10.1
Other	1.4	2.5	1.8
Unknown	2.4	2.7	2.5
Percent Female	61.9	61.3	64.6
Mortality Rate			
Within 90 days of index claim	10.2	2.3	0.7
Within 180 days of index claim	15.1	4.2	1.5
Sample Size	62,997	102,472	73,371

NOTE: For each condition, the sample was defined as beneficiaries who had at least one Part B claim during the first half of 1992 on which that condition was identified as a line item diagnosis on the claim.

highest mortality rate of the three patient groups; 10 percent died within 90 days of the index claim and 15 percent died within 180 days of the index claim.[20]

Among chronic conditions, diabetes deserves particular attention as a potential candidate for a bundling demonstration because of the many complications that can arise from it. Weiner et al. (1995) have found that the majority of Medicare beneficiaries with diabetes are not receiving the services recommended by relevant physician associations. If bundling could provide a mechanism in which patients with diabetes would receive better coordinated care, it could potentially result in both improved health outcomes and lower costs. Diabetes has been a key focus of disease management programs being developed by employers and private insurers (Terry 1995), and diabetes management has been mentioned in the health industry trade literature as a potential candidate for bundling by private health plans (*Managed Care Week: Provider Contracting and Capitation*, July 10, 1995).

Diabetes occurs in two major forms: Type I (insulin-dependent diabetes) and Type II (non-insulin-dependent diabetes). Patients with Type I diabetes require exogenous insulin, while patients with Type II diabetes do not. Proper diet, exercise, and, in some cases, oral hypoglycemics are sufficient to control blood glucose levels of most persons with Type II diabetes (American Diabetes Association 1993). If Type I diabetes is inadequately controlled it can lead to ketoacidosis, which can result in coma and death. The chronic complications of diabetes include various types of microvascular and macrovascular tissue damage. The microvascular complications, which are most commonly associated with Type I diabetes, include eye, kidney, and nerve damage. The macrovascular complications, which are most commonly associated with Type II diabetes, include atherosclerosis, AMI, and stroke.

This discussion suggests that, in examining the potential for a bundling demonstration, it is useful to consider whether the bundled payment should be designed to cover the direct treatment of diabetes, or whether it should be expanded to cover all treatment required by diabetic patients--or at least all treatment for a specified set of complications that are associated with diabetes. The latter approach would provide the strongest financial incentives for physician groups to manage their patients' care so as to minimize the incidence and/or severity of the associated complications. The fact that Type I and Type II diabetes require different treatments and tend to be associated with different types of complications suggests that consideration should be given to setting bundled rates separately for Type I and Type II. In the ICD-9-CM diagnostic coding system, the distinction between Type I and Type II diabetes is made in the fifth digit of the code, which is not always present. In our examination of diagnosis codes on the Part B claims for physician/supplier services for our sample of diabetes patients, we found that sample members fell into the following categories:

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[20] Heart failure, which is classified by the three-digit ICD-9-CM diagnosis code 428, includes congestive heart failure (428.0), left heart failure (428.1), and unspecified heart failure (428.9).

- 22 percent of the sample could not be classified as either Type I or Type II because no fifth-digit diagnosis codes appeared on any of their claims.
- 12 percent of the sample had some claims indicating they had Type I diabetes and some claims indicating they had Type II diabetes.
- 59 percent of the sample had claims indicating they had Type II diabetes (although about a fifth of these individuals also had at least one claim that did not specify the type of diabetes).
- 8 percent of the sample had claims indicating they had Type I diabetes (although about a quarter of these individuals also had at least one claim that did not specify the type of diabetes).

Thus, improved coding practices would be required if the diagnostic codes on Part B claims were to be used to set bundled payment rates separately for Type I and Type II diabetes.

Among the diabetes patients in our sample, the mean Part B cost for treatment of diabetes during the 180-day period beginning on the date of the index claim was $126 (Table III.10). This figure includes the costs of services on Part B physician/supplier claims for which diabetes was the line-item diagnosis and costs on outpatient hospital claims for which diabetes was the principal diagnosis. The coefficient of

TABLE III.10

MEDICARE PAYMENTS FOR BENEFICIARIES WITH SELECTED CHRONIC CONDITIONS

	Part B Payments		Part B Plus Inpatient Hospital Payments		Percent Hospitalized, By Principal Diagnosis
Sample/Diagnosis	Mean	CV[a]	Mean	CV[a]	
Heart Failure Sample					
Payments For:					
Heart Failure	$237	1.70	$1,322	2.76	17.9
Related Diagnoses[b]	364	2.49	1,685	3.53	13.8
Other Diagnoses	986	1.54	3,112	2.25	23.6
Invalid Diagnoses[c]	116	3.36	116	3.36	0
Diabetes Sample[d]					
Payments For:					
Diabetes	126	1.89	260	4.98	2.4
Other Diagnoses	954	1.83	2,761	2.48	19.7
Invalid Diagnoses[c]	64	4.88	64	4.88	0
Glaucoma Sample					
Payments For:					
Glaucoma	126	2.60	130	2.77	0.2
Other Eye Conditions	152	3.85	158	3.98	0.2
Other Diagnoses	601	1.99	1,471	3.14	11.4
Invalid Diagnoses[c]	32	6.88	32	6.88	0

NOTE: Mean Medicare payments and percent hospitalized were computed for the 180-day period beginning on the date of the "index" claim for the chronic condition.

[a] CV = Coefficient of variation.

[b] For the heart failure sample, related diagnoses were defined as all other diseases of the circulatory system (ICD-9-CM codes 390-427 and 429-459).

[c] Includes missing as well as invalid diagnoses.

[d] Because of the wide range of potential complications associated with diabetes, we do not attempt to distinguish related diagnoses from other diagnoses in this table. In Table III.12, we present data on costs for various complications of diabetes.

variation of the Part B costs for treatment of diabetes was 1.89. Two percent of the diabetes sample was hospitalized during the 180-day observation period with a principal diagnosis of diabetes.

Diabetes patients received a substantial amount of care for other conditions during this period. The mean Part B cost for treatment of all other conditions was $954, and the mean Part B plus inpatient cost was $2,761. Twenty percent of the diabetes patients were hospitalized during the 180-day observation period for a principal diagnosis other than diabetes. Below, we present data on the costs incurred for various conditions that have been identified as complications of diabetes.

Beneficiaries with heart failure received a substantial amount of care for other conditions as well as the care they received for heart failure. The mean Part B cost of treating heart failure for this group ($237) was lower than the mean Part B treatment cost incurred for all other diseases of the circulatory system ($364) and for all other conditions ($986). Twenty-four percent of the heart failure patients were hospitalized during our observation period for a condition other than heart failure or another disease of the circulatory system. Thus, as we discuss further below, many heart failure patients have a number of other serious medical conditions, which could complicate a bundled payment system for heart failure.

The Part B cost of treating glaucoma for our sample had a mean of $126 and a coefficient of variation of 2.6. On average, $152 in Part B costs were incurred for the treatment of other eye conditions among glaucoma patients. Glaucoma patients had lower costs for other conditions and lower hospitalization rates than patients in the heart failure and diabetes samples.

The Medicare costs of treating each of the three chronic conditions varied widely across patients (Table III.11).[21] For each condition, the distribution of costs was much more widely dispersed than the corresponding distribution of costs for treating hip fracture and AMI (see Table III.2 above). For example, if the bundled rate for Part B services for treating heart failure was set at the mean Part B treatment cost

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[21] Since our measure of cost is the amount paid by Medicare, some patients had zero costs (but positive Part B allowed charges) because they had not met their Part B deductible.

TABLE III.11

DISTRIBUTION OF MEDICARE PAYMENTS FOR BENEFICIARIES WITH SELECTED CHRONIC CONDITIONS

	Percentiles of Medicare Payments					
Sample/Diagnoses	5th	25th	50th	75th	95th	Mean Payment
Heart Failure Sample						
Part B Payments For:						
Heart Failure	$0	$29	$91	$272	$963	$237
Related Diagnoses	0	0	76	303	1,640	364
Other Diagnoses	0	129	432	1,244	3,718	986
Part B Plus Inpatient Hospital Payments For:						
Heart Failure	0	29	96	451	6,478	1,322
Related Diagnoses	0	0	81	417	8,622	1,685
Other Diagnoses	0	136	528	3,333	14,249	3,112
Diabetes Sample[b]						
Part B Payments For:						
Diabetes	0	25	64	140	446	126
Other Diagnoses	0	84	309	1,097	3,993	954
Part B Plus Inpatient Hospital Payments For:						
Diabetes	0	25	64	142	570	260
Other Diagnoses	0	85	326	2,042	14,007	2,761
Glaucoma Sample						
Part B Payments For:						
Glaucoma	0	9	39	90	635	126
Other Eye Conditions	0	0	0	20	1,220	152
Other Diagnoses	0	55	200	594	2,594	601
Part B Plus Inpatient Hospital Payments For:						
Glaucoma	0	9	39	90	638	130
Other Eye Conditions	0	0	0	25	1,264	158
Other Diagnoses	0	55	201	650	7,923	1,471

NOTE: Related diagnoses were defined in the same manner as in Table III.10.

[a] Because of the wide range of potential complications associated with diabetes, we do not attempt to distinguish related diagnoses from other diagnoses in this table. In Table III.12, we present data on costs for various complications of diabetes.

for our sample ($237), this bundled rate would exceed the actual Part B cost for patients at the 25th percentile ($29) by over 700 percent and would be 75 percent below the actual Part B cost for patients at the 95th percentile ($963). In contrast, the figures presented above in Table III.2 indicate that if the Part B bundled rate for hip fracture was set at the mean Part B treatment cost for our sample ($1,539), this bundled rate would exceed the actual Part B cost for patients at the 25th percentile ($1,101) by 40 percent and would be 64 percent below the actual Part B cost for patients at the 95th percentile ($3,017).

This difference in the distribution of costs for hip fracture and heart failure is even greater if we expand the definition of the bundled payment for heart failure to also include Part B services for treating other diseases of the circulatory system and/or inpatient services. Thus, under a bundled payment system for heart failure (or the two other chronic conditions), physician groups would experience very large gains on many patients and large losses on other patients. The size of these losses and gains would be much larger, on average, than under a bundling demonstration for hip fracture. This would increase the risk that the gains a given physician group would experience on some patients would not be offset by losses on other patients, so that many groups might experience large revenue gains or losses overall relative to their payments under the existing payment system. On this basis, the three chronic conditions appear to be less suitable for a bundling demonstration than hip fracture.

A significant percentage of beneficiaries with the three chronic conditions we have examined also had claims during our observation period for other chronic and acute conditions. For example, among beneficiaries in the heart failure sample, 34 percent had Part B claims for ischemic heart disease, 41 percent had claims for other forms of heart disease, 19 percent had claims for diabetes, 22 percent had claims for hypertension, and 12 percent had claims for cerebrovascular disease (Table III.12). This could seriously complicate a bundling demonstration for heart failure, since it may be necessary to adjust payment rates depending on whether patients have other conditions (such as diabetes). A significant

TABLE III.12

PART B PAYMENTS FOR COMORBIDITIES AMONG MEDICARE BENEFICIARIES WITH SELECTED CHRONIC CONDITIONS

		Mean Part B Payments for Comorbidity	
Sample/Comorbidity[a]	Percentage with Part B Payments for Comorbidity	Total	Among Those With Positive Payments For the Comorbidity
Heart Failure Sample			
Hypertension (401)	22.2	$18	$80
Diabetes (250)	18.5	28	149
Ischemic Heart Disease (410-414)	34.0	131	384
Other Forms of Heart Disease (415-427, 429)	41.2	113	274
Cerebrovascular Disease (430-438)	11.8	46	391
Nephritis, Nephrotic Syndrome, and Nephrosis (580-589)	5.2	20	383
Hypertensive Heart Disease or Renal Disease (402-404)	4.7	5	116
Diabetes Sample			
Hypertension (401)	25.6	18	70
Ischemic Heart Disease (410-414)	18.7	75	404
Other Forms of Heart Disease (415-429)	22.7	61	269
Hypertensive Heart Disease or Renal Disease (402-404)	3.2	3	86
Cerebrovascular Disease (430-438)	9.0	38	426
Other Retinal Disorders (362)	8.0	18	224
Cataract (366)	13.8	79	572
Diseases of the Arteries, Arterioles, and Capillaries (440-448)	8.1	25	310
Peripheral Nervous System Disorders (350-359)	3.0	7	224

TABLE III.12 *(continued)*

Sample/Comorbidity[a]	Percentage with Part B Payments for Comorbidity	Mean Part B Payments for Comorbidity: Total	Mean Part B Payments for Comorbidity: Among Those With Positive Payments For the Comorbidity
Nephritis, Nephrotic Syndrome, and Nephrosis (580-589)	2.1	8	366
Glaucoma Sample			
Hypertension (401)	26.8	19	72
Diabetes (250)	12.8	14	110
Cataract (366)	14.5	114	784
Other Retinal Disorders (362)	5.1	10	193

NOTE: Payments for comorbidities were computed based on line-item diagnoses on claims for services received within 180 days following the date of service on the index claim.

[a] Comorbidities are identified by 3-digit ICD-9-CM diagnosis codes.

percentage of beneficiaries in the diabetes sample also had Part B claims for other conditions, and in some cases these may have been complications of their diabetes.

Based on the analyses described above and the conceptual analyses in Chapter II, we believe the chronic conditions we have examined are less well suited for a bundling demonstration than hip fracture. Therefore, we did not conduct simulations of the type described earlier for hip fracture for any of the chronic conditions.

IV. CONCLUSIONS

In this report, we used two approaches to evaluate the feasibility and desirability of HCFA conducting a demonstration of condition-based bundling under Medicare. First, we conducted a conceptual analysis to examine in detail how such a demonstration would operate, what incentives would face providers and beneficiaries, what key obstacles would have to be overcome, what administrative burdens would be imposed on HCFA, and whether condition-based bundling is likely to be successful. Second, we conducted a statistical analysis of Medicare claims data to assess the suitability of selected medical conditions for a demonstration of condition-based bundling.

We concluded that condition-based bundling for chronic conditions would face significant design obstacles that cast serious doubt on the likely success of this payment approach. Condition-based bundling for acute conditions that meet certain well-defined criteria would face less serious design obstacles and have greater potential for success. In a bundling demonstration for a chronic condition, physician groups would receive bundled payments from Medicare monthly or quarterly in exchange for agreeing to provide, or arrange for the provision of, all Medicare services required for the management of the chronic condition. The design obstacles that would face such a demonstration concern three issues: (1) out-of-network service use, (2) defining the "enrollment" period for payment purposes, and (3) potential gaming behavior by physicians.

The success of bundling for a chronic condition would depend on the extent to which enrollees (or patients) of the participating physician groups remain within those groups for all of their care covered under the bundled payment. If patients go outside their groups for care that should have been covered under the bundled rate, and if HCFA pays for that out-of-network service use without making corresponding adjustments to the bundled payments, bundling could lead to higher Medicare costs. A formal lock-in provision analogous to that used by HMOs, except limited to the condition covered under the bundled rate, is not likely to be feasible, since beneficiaries would be unlikely to accept such a restriction on their Medicare benefits--particularly when they could obtain care from a participating group without accepting that restriction.

Out-of-network service use could result from a variety of factors. For example, patients might decide to seek some care for the "bundled" condition from other physicians in their area, they may require care while traveling outside the area, or they may require emergency care and be transported to a hospital that is not affiliated with their physician group. Each of these circumstances would lead to the filing of fee-for-service (FFS) claims for services rendered for the bundled condition. In addition, if participating physician groups are not at risk for out-of-network service use, they would have incentives to refer their patients to other providers for expensive services (such as certain diagnostic procedures) rather than providing them under the bundled payment. For these reasons, HCFA would need to place participating physician groups at financial risk for out-of-network services. This would require that HCFA monitor the FFS claims of demonstration patients to determine their costs for out-of-network services.

A second major challenge confronting a bundling demonstration for a chronic condition is the difficulty that HCFA would face in determining on a continuing basis whether a particular beneficiary should still be consider enrolled in the group, and thus whether Medicare should continue making bundled payments for that person. For example, consider a beneficiary who makes an initial visit to a physician group to receive routine care for diabetes, enrolls in a diabetes management program offered by the group, but never returns for follow-up care. For how long should Medicare continue making monthly or quarterly bundled payments for such a person?

In principle, HCFA could make bundled payments only for beneficiaries who exceed a certain threshold number of visits per year. However, this would mean that physician groups would receive bundled payments only for their patients who are most expensive to treat and would receive FFS payments for the others. Physician groups would correctly argue that this bias should be taken into account when

HCFA sets the bundled payment rate. In addition, making bundled payments only for beneficiaries who exceed a minimum number of visits would introduce incentives for physician groups to game the system by encouraging their healthiest patients to come for more visits than is medically necessary in order to continue receiving bundled payments for them (instead of the relatively low FFS payments they would otherwise receive for their healthiest patients).

HCFA could try to minimize this problem by selecting a chronic condition for which patients require active treatment on an ongoing basis, such as cancer. However, making bundled payments for the period in which patients are actively receiving cancer treatment would also be problematic, since physician groups would have an incentive to extend the period of "active" treatment beyond what might be considered medically necessary in order to continue receiving bundled payments for the patient over a longer period.

The third major challenge that would face a bundled payment system for a chronic condition is the potential for physicians to game the system. The key ways in which physicians could game such a system are through efforts to achieve favorable risk selection and "out-of-bundle" billing. The latter refers to the incentive that physicians who are treating patients for multiple conditions would face to submit FFS bills for services that are relevant to the treatment of both the bundled condition and another condition, rather than providing the service under the bundled payment. In addition, some physicians might falsely claim that a service they provided for the bundled condition was provided for another condition and thus submit a FFS bill to Medicare.

These design challenges would be significantly lessened under a bundled payment system for certain acute conditions. Because of the relatively short treatment period for acute conditions, there would be less opportunity for out-of-network service use. Furthermore, since the bundled payment would cover treatment throughout the acute episode of care, HCFA would not face the challenging task of determining the period of time over which it should continue making bundled payments for a given beneficiary. Although the possibility of gaming behavior by physician groups would remain under bundling for an acute condition, HCFA would have greater ability to limit such behavior than in the case of a chronic condition. For example, HCFA could require that all visits during the acute episode of care be covered under the bundled payment.

Our statistical analysis of Medicare claims data examined the suitability of six conditions for a bundling demonstration: three acute conditions (hip fracture, acute myocardial infarction, and septicemia) and three chronic conditions (diabetes, heart failure, and glaucoma). This analysis was based on 1992 Medicare claims for a 5 percent random sample of the national Medicare population that was not enrolled in a Medicare managed care plan. We concluded from this analysis that hip fracture deserves additional consideration for a bundling demonstration.

We conducted simulations of three bundled payment models for hip fracture, in which the services covered under the bundled rate are (1) Part B services only, (2) Part B services plus inpatient hospital care, and (3) Part B services, inpatient hospital care, and post-acute services. We included the final model as an option because 71 percent of the hip fracture patients in our sample used either SNF or home health services following hospital discharge. We conducted two sets of simulations, the first assuming a national bundled payment rate, and the second assuming a bundled rate that was adjusted to reflect regional differences in the mean costs to Medicare of treating hip fracture patients.

We conducted the simulations by randomly assigning hip fracture patients to sets of hypothetical physician groups of varying size. The simulations compared the bundled payments physician groups would receive under a demonstration with the actual payments that Medicare made for their patients. One of our objectives was to determine how many hip fracture patients were needed per group to permit adequate risk-spreading under each of the three bundling models--i.e., to limit the risk of some groups experiencing very large financial losses due to chance. Our second objective was to determine how groups would fare under the national rates versus the regionally-adjusted rates.

Our simulations indicated that under the regionally-adjusted rates, the hypothetical physician groups received bundled payments that were closer to the actual payments they received under the current payment system than was the case under the national rates. Whether such a result is desirable depends on the extent to which the current regional variation in the mean Medicare cost of treating hip fracture patients is appropriate. Based on the simulations using the regionally-adjusted rates, we found that adequate risk-spreading occurs with as few as 100 to 250 hip fracture patients per year. This was true for all three of the bundling models we examined, including the model in which post-acute services were covered under the bundled rate.

The results of our analysis on Medicare hip fracture patients suggest several areas for future research. First, it would be useful to conduct analyses of the type presented in this report on a much larger sample of hip fracture patients. Our sample of hip fracture patients was relatively small (4,522) because it was derived from a 5 percent sample of the national Medicare population. Consequently, we were required to construct hypothetical physician groups for our simulations by randomly assigning hip fracture patients within a given Census region to each group. A much larger sample could be obtained by using Medicare inpatient hospital claims to identify *all* Medicare beneficiaries who were treated for hip fracture in a given year. With this much larger sample, it would be possible to simulate the effects of a bundling demonstration for hip fracture on particular metropolitan and nonmetropolitan areas and, using the provider ID on the file, for specific hospitals. The latter would be particularly interesting, since it would be possible to assess whether and to what extent the case-mix of hip fracture patients varies across various types of hospitals (teaching versus nonteaching, inner-city versus suburban, and so on) and how these different types of hospitals would be affected by a bundled payment system.

It would also be useful to examine how a condition-based bundling demonstration for hip fracture patients would compare with a procedure-based demonstration in which bundled payments would be made for all Medicare patients who undergo certain hip procedures. The latter type of demonstration would include not only beneficiaries who require hip procedures because of a fracture but also those require such procedures because of other conditions, such as osteoarthrosis. This type of study could be conducted in the same manner as described in the previous paragraph, except that the sample would be selected on the basis of DRG codes rather than on the basis of principal diagnosis.

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